

```
In [1]: import numpy as np
import pandas as pd
from matplotlib import pyplot as plt
import seaborn as sns
import missingno as msno
```

## Loading the data

```
In [2]: data = pd.read_csv("file:///C:/Users/Vasu%20Prasad/OneDrive/Documents/MCA/IPL_Project/Dataset/2023/batting_sur  
data.head()
```

Out[2]:

|   | Unnamed: 0 | Date    | Time     | Stadium                | City      | Match Details                                     | Team Playing                | Total Runs | Total Wickets | Batsman Names   | Out/Not Out                     | Balls Played | Runs Scored | Fours | Sixes |
|---|------------|---------|----------|------------------------|-----------|---|-----------------------------|------------|---------------|-----------------|---------------------------------|--------------|-------------|-------|-------|
| 0 | 0          | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Conway          | b Shami                         | 6.0          | 1           | 0.0   | 0.0   |
| 1 | 1          | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Ruturaj Gaikwad | c Shubman Gill b Alzarri Joseph | 50.0         | 92          | 4.0   | 9.0   |
| 2 | 2          | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Moeen           | c W Saha b Rashid Khan          | 17.0         | 23          | 4.0   | 1.0   |
| 3 | 3          | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Stokes          | c W Saha b Rashid Khan          | 6.0          | 7           | 1.0   | 0.0   |

| Unnamed: 0 | Date | Time    | Stadium  | City                   | Match Details | Team Playing                                      | Total Runs | Total Wickets | Batsman Names | Out/Not Out     | Balls Played | Runs Scored | Fours | Sixes |
|------------|------|---------|----------|------------------------|---------------|---|------------|---------------|---------------|-----------------|--------------|-------------|-------|-------|
| 4          | 4    | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad     | Gujarat Titans vs Chennai Super Kings, 1st Mat... | 178        | 7             | Rayudu        | b Joshua Little | 12.0         | 12          | 0.0   | 1.0   |

```
In [3]: data.drop("Unnamed: 0",axis = 1,inplace = True) #Dropping the unwanted column
```

```
In [4]: data.head()
```

```
Out[4]:
```

|   | Date    | Time     | Stadium                | City      | Match Details                                     | Team Playing                | Total Runs | Total Wickets | Batsman Names   | Out/Not Out                     | Balls Played | Runs Scored | Fours | Sixes | Strike Rate |
|---|---------|----------|------------------------|-----------|---|-----------------------------|------------|---------------|-----------------|---------------------------------|--------------|-------------|-------|-------|-------------|
| 0 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Conway          | b Shami                         | 6.0          | 1           | 0.0   | 0.0   | 16.67       |
| 1 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Ruturaj Gaikwad | c Shubman Gill b Alzarri Joseph | 50.0         | 92          | 4.0   | 9.0   | 184.00      |
| 2 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Moeen           | c W Saha b Rashid Khan          | 17.0         | 23          | 4.0   | 1.0   | 135.29      |
| 3 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Stokes          | c W Saha b Rashid Khan          | 6.0          | 7           | 1.0   | 0.0   | 116.67      |
| 4 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Rayudu          | b Joshua Little                 | 12.0         | 12          | 0.0   | 1.0   | 100.00      |

In [5]: `data.describe()`

Out[5]:

|              | Total Runs  | Total Wickets | Balls Played | Fours       | Sixes       | Strike Rate |
|--------------|-------------|---------------|--------------|-------------|-------------|-------------|
| <b>count</b> | 1131.000000 | 1131.000000   | 1111.000000  | 1111.000000 | 1110.000000 | 1111.000000 |
| <b>mean</b>  | 170.764810  | 6.824050      | 14.606661    | 1.839784    | 0.945045    | 116.363816  |
| <b>std</b>   | 32.114252   | 2.116933      | 13.512594    | 2.494947    | 1.560227    | 72.425830   |
| <b>min</b>   | 59.000000   | 1.000000      | 0.000000     | 0.000000    | 0.000000    | 0.000000    |
| <b>25%</b>   | 146.000000  | 5.000000      | 4.000000     | 0.000000    | 0.000000    | 66.670000   |
| <b>50%</b>   | 174.000000  | 7.000000      | 10.000000    | 1.000000    | 0.000000    | 119.050000  |
| <b>75%</b>   | 197.000000  | 8.000000      | 21.000000    | 3.000000    | 1.000000    | 161.540000  |
| <b>max</b>   | 257.000000  | 10.000000     | 66.000000    | 16.000000   | 10.000000   | 600.000000  |

In [6]: `data.info()`

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1131 entries, 0 to 1130
Data columns (total 15 columns):
 #   Column                Non-Null Count  Dtype  
---  -
 0   Date                  1131 non-null   object 
 1   Time                  1131 non-null   object 
 2   Stadium               1131 non-null   object 
 3   City                  1131 non-null   object 
 4   Match Details         1131 non-null   object 
 5   Team Playing          1131 non-null   object 
 6   Total Runs            1131 non-null   int64  
 7   Total Wickets         1131 non-null   int64  
 8   Batsman Names         1109 non-null   object 
 9   Out/Not Out           1112 non-null   object 
10   Balls Played          1111 non-null   float64 
11   Runs Scored           1125 non-null   object 
12   Fours                 1111 non-null   float64 
13   Sixes                 1110 non-null   float64 
14   Strike Rate           1111 non-null   float64 
dtypes: float64(4), int64(2), object(9)
memory usage: 132.7+ KB
```

In [7]: `data.dtypes`

```
Out[7]: Date          object
        Time          object
        Stadium       object
        City          object
        Match Details object
        Team Playing  object
        Total Runs    int64
        Total Wickets int64
        Batsman Names object
        Out/Not Out   object
        Balls Played  float64
        Runs Scored   object
        Fours         float64
        Sixes         float64
        Strike Rate   float64
        dtype: object
```

```
In [8]: data.isnull().sum().reset_index().rename(columns = {0:"count"}) #checking the null values
```

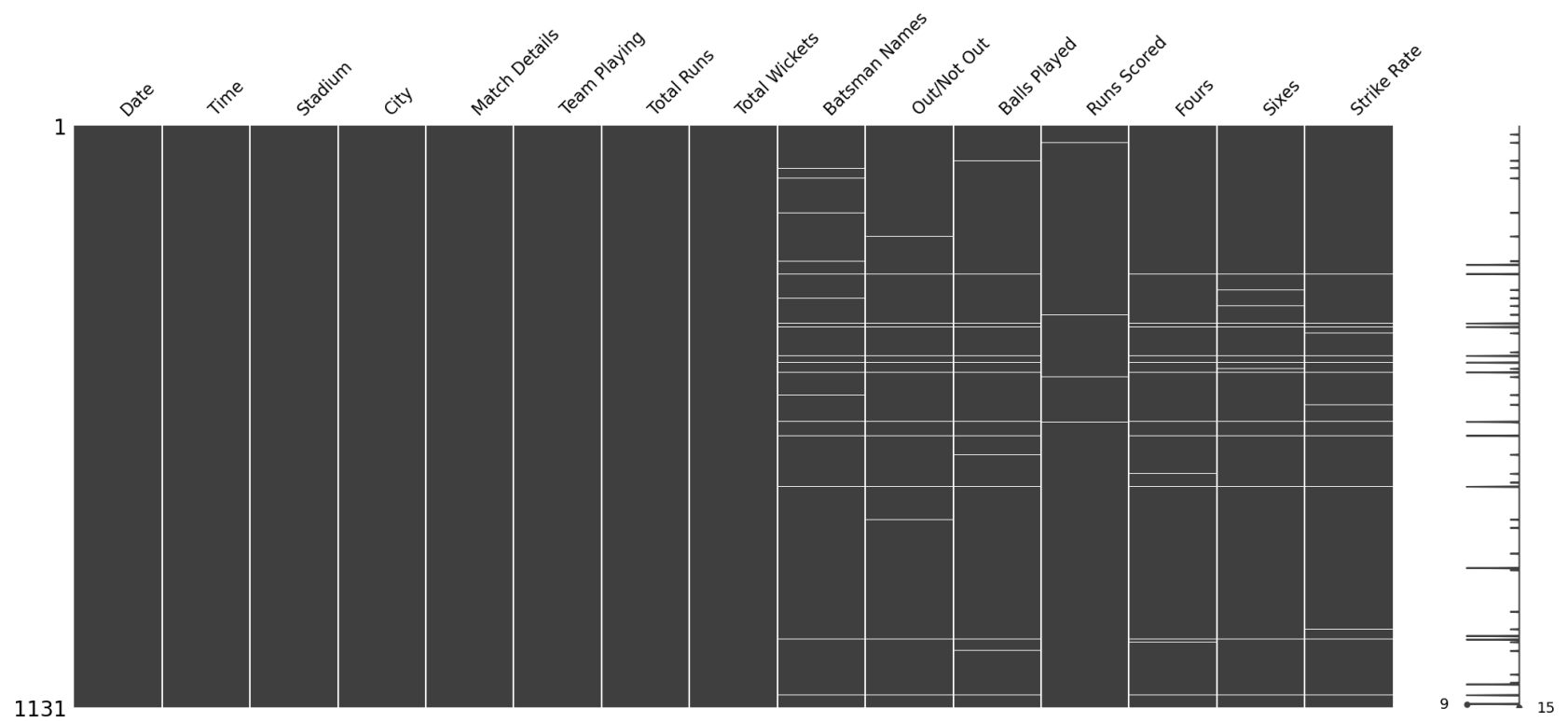
Out[8]:

|    | index         | count |
|----|---------------|-------|
| 0  | Date          | 0     |
| 1  | Time          | 0     |
| 2  | Stadium       | 0     |
| 3  | City          | 0     |
| 4  | Match Details | 0     |
| 5  | Team Playing  | 0     |
| 6  | Total Runs    | 0     |
| 7  | Total Wickets | 0     |
| 8  | Batsman Names | 22    |
| 9  | Out/Not Out   | 19    |
| 10 | Balls Played  | 20    |
| 11 | Runs Scored   | 6     |
| 12 | Fours         | 20    |
| 13 | Sixes         | 21    |
| 14 | Strike Rate   | 20    |



```
In [9]: msno.matrix(data) # Displaying the null values
```

```
Out[9]: <Axes: >
```



```
In [10]: # Locatins of the null values
data[data["Batsman Names"].isna() | data["Out/Not Out"].isna() | data["Balls Played"].isna() | data["Runs Scored"].isna()]
```

Out[10]:

|    | Date    | Time     | Stadium   | City      | Match Details                                     | Team Playing                 | Total Runs | Total Wickets | Batsman Names | Out/Not Out            | Balls Played | Runs Scored |
|----|---------|----------|---|-----------|---|------------------------------|------------|---------------|---------------|------------------------|--------------|-------------|
| 17 | Apr 01, | 03:30 PM | Punjab Cricket Association IS Bindra Stadium,     | Mohali    | Punjab Kings vs Kolkata Knight Riders, 2nd Mat... | Punjab Kings Innings         | 191        | 5             | Dhawan (c)    | NaN                    | 29.0         | 40          |
| 33 | Apr 01, | 07:30 PM | Bharat Ratna Shri Atal Bihari Vajpayee Ekana C... | Lucknow   | Lucknow Super Giants vs Delhi Capitals, 3rd Ma... | Lucknow Super Giants Innings | 193        | 6             | K Mayers      | b Axar                 | 38.0         | NaN         |
| 68 | Apr 02, | 07:30 PM | M.Chinnaswamy Stadium,                            | Bengaluru | Royal Challengers Bangalore vs Mumbai Indians,... | Mumbai Indians Innings       | 171        | 7             | Rohit (c)     | c Karthik b Akash Deep | NaN          | 1           |

## Updating the null values

```
In [11]: data.at[17, "Out/Not Out"]
```

Out[11]: nan

```
In [12]: data.at[17, "Out/Not Out"] = "b Chakaravarthy"
```

```
In [13]: data.at[33, "Runs Scored"]
```

Out[13]: nan

```
In [14]: data.at[33, "Runs Scored"] = 73
```

```
In [15]: data.at[68,"Balls Played"]
```

```
Out[15]: nan
```

```
In [16]: data.at[68,"Balls Played"] = 10
```

```
In [17]: data.at[82,"Batsman Names"]
```

```
Out[17]: nan
```

```
In [18]: data.at[82,"Batsman Names"] = "Conway"
```

```
In [19]: data.at[102,"Batsman Names"]
```

```
Out[19]: nan
```

```
In [20]: data.at[102,"Batsman Names"] = "Sarfaraz Khan"
```

```
In [21]: data.at[169,"Batsman Names"]
```

```
Out[21]: nan
```

```
In [22]: data.at[169,"Batsman Names"] = "Samsom(c & WK)"
```

```
In [23]: data.at[215,"Out/Not Out"]
```

```
Out[23]: nan
```

```
In [24]: data.at[215,"Out/Not Out"] = "not out"
```

```
In [25]: data.at[263,"Batsman Names"]
```

```
Out[25]: nan
```

```
In [26]: data.at[263,"Batsman Names"] = "Padikkal"
```

```
In [27]: data.at[335,"Batsman Names"]
```

```
Out[27]: nan
```

```
In [28]: data.at[335,"Batsman Names"] = "N Jagadeesan"
```

```
In [29]: data.at[319,"Sixes"]
```

```
Out[29]: nan
```

```
In [30]: data.at[319,"Sixes"] = 2
```

```
In [31]: data.at[350,"Sixes"]
```

```
Out[31]: nan
```

```
In [32]: data.at[350,"Sixes"] = 1
```

```
In [33]: data.at[367,"Runs Scored"]
```

```
Out[33]: nan
```

```
In [34]: data.at[367,"Runs Scored"] = 3
```

```
In [35]: data.at[403,"Strike Rate"]
```

```
Out[35]: nan
```

```
In [36]: data.at[403,"Strike Rate"] = 125.53
```

```
In [37]: data.at[440,"Runs Scored"]
```

```
Out[37]: nan
```

```
In [38]: data.at[440,"Runs Scored"] = 34
```

```
In [39]: data.at[472,"Sixes"]
```

```
Out[39]: nan
```

```
In [40]: data.at[472,"Sixes"] = 1
```

```
In [41]: data.at[488,"Runs Scored"]
```

```
Out[41]: nan
```

```
In [42]: data.at[488,"Runs Scored"] = 0
```

```
In [43]: data.at[523,"Batsman Names"]
```

```
Out[43]: nan
```

```
In [44]: data.at[523,"Batsman Names"] = "Warner(c)"
```

```
In [45]: data.at[542,"Strike Rate"]
```

```
Out[45]: nan
```

```
In [46]: data.at[542,"Strike Rate"] = 57.14
```

```
In [47]: data.at[576,"Runs Scored"]
```

```
Out[47]: nan
```

```
In [48]: data.at[576,"Runs Scored"] = 12
```

```
In [49]: data.at[639,"Balls Played"]
```

```
Out[49]: nan
```

```
In [50]: data.at[639,"Balls Played"] = 19
```

```
In [51]: data.at[676,"Fours"]
```

```
Out[51]: nan
```

```
In [52]: data.at[676,"Fours"] = 0
```

```
In [53]: data.at[693,"Fours"]
```

```
Out[53]: nan
```

```
In [54]: data.at[693,"Fours"] = 1
```

```
In [55]: data.at[765,"Out/Not Out"]
```

```
Out[55]: nan
```

```
In [56]: data.at[765,"Out/Not Out"] = "c Axar b Mitchell Marsh"
```

```
In [57]: data.at[781,"Sixes"]
```

```
Out[57]: nan
```

```
In [58]: data.at[781,"Sixes"] = 0
```

```
In [59]: data.at[831,"Fours"]
```

```
Out[59]: nan
```

```
In [60]: data.at[831,"Fours"] = 1
```

```
In [61]: data.at[863,"Sixes"]
```

```
Out[61]: nan
```

```
In [62]: data.at[863,"Sixes"] = 1
```

```
In [63]: data.at[944,"Balls Played"]
```

```
Out[63]: nan
```

```
In [64]: data.at[944,"Balls Played"] = 3
```

```
In [65]: data.at[978,"Strike Rate"]
```

```
Out[65]: nan
```

```
In [66]: data.at[978,"Strike Rate"] = 148.39
```

```
In [67]: data.at[1003,"Fours"]
```

```
Out[67]: nan
```

```
In [68]: data.at[1003,"Fours"] = 0
```

```
In [69]: data.at[1020,"Balls Played"]
```

```
Out[69]: nan
```

```
In [70]: data.at[1020,"Balls Played"] = 9
```

```
In [71]: data.at[1066,"Runs Scored"]
```

```
Out[71]: nan
```

```
In [72]: data.at[1066,"Runs Scored"] = 11
```

```
In [73]: data.at[1082,"Strike Rate"]
```

```
Out[73]: nan
```

```
In [74]: data.at[1082,"Strike Rate"] = 137.5
```

```
In [75]: data.isnull().sum().reset_index().rename(columns = {0:"count"})
```

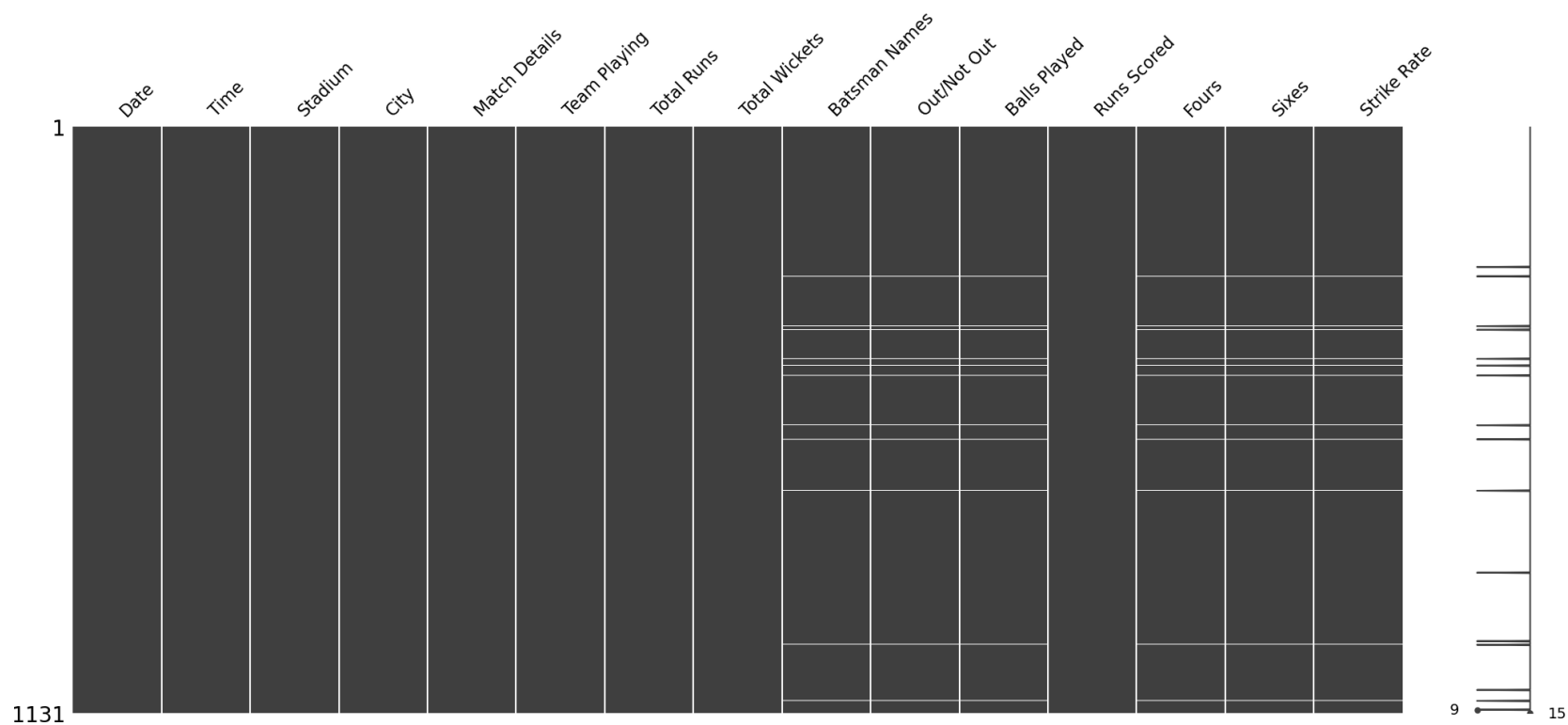
Out[75]:

|    | index         | count |
|----|---------------|-------|
| 0  | Date          | 0     |
| 1  | Time          | 0     |
| 2  | Stadium       | 0     |
| 3  | City          | 0     |
| 4  | Match Details | 0     |
| 5  | Team Playing  | 0     |
| 6  | Total Runs    | 0     |
| 7  | Total Wickets | 0     |
| 8  | Batsman Names | 16    |
| 9  | Out/Not Out   | 16    |
| 10 | Balls Played  | 16    |
| 11 | Runs Scored   | 0     |
| 12 | Fours         | 16    |
| 13 | Sixes         | 16    |
| 14 | Strike Rate   | 16    |



```
In [76]: msno.matrix(data)
```

```
Out[76]: <Axes: >
```



```
In [77]: data[data["Batsman Names"].isna()] #null values
```

```
Out[77]:
```

|     | Date    | Time     | Stadium                                       | City      | Match Details                                     | Team Playing                        | Total Runs | Total Wickets | Batsman Names | Out/ Not Out | Balls Played | Runs Scored                  | Fours | Sixes |
|-----|---------|----------|---|-----------|---|-------------------------------------|------------|---------------|---------------|--------------|--------------|------------------------------|-------|-------|
| 270 | Apr 12, | 07:30 PM | MA Chidambaram Stadium,                       | Chennai   | Chennai Super Kings vs Rajasthan Royals, 17th ... | Rajasthan Royals Innings            | 175        | 8             | NaN           | NaN          | NaN          | (b 0, lb 0, w 10, nb 0, p 0) | NaN   | NaN   |
| 288 | Apr 13, | 07:30 PM | Punjab Cricket Association IS Bindra Stadium, | Mohali    | Punjab Kings vs Gujarat Titans, 18th Match - L... | Punjab Kings Innings                | 153        | 8             | NaN           | NaN          | NaN          | (b 0, lb 2, w 9, nb 0, p 0)  | NaN   | NaN   |
| 384 | Apr 17, | 07:30 PM | M.Chinnaswamy Stadium,                        | Bengaluru | Royal Challengers Bangalore vs Chennai Super K... | Royal Challengers Bangalore Innings | 218        | 8             | NaN           | NaN          | NaN          | (b 0, lb 5, w 6, nb 0, p 0)  | NaN   | NaN   |

```
In [78]: # Dropping the null values
data.dropna(inplace = True)
data
```

Out[78]:

|   | Date    | Time     | Stadium                | City      | Match<br>Details                                  | Team<br>Playing             | Total<br>Runs | Total<br>Wickets | Batsman<br>Names | Out/Not<br>Out                  | Balls<br>Played | Runs<br>Scored | Fours | Sixes | Strike<br>Rate |
|---|---------|----------|------------------------|-----------|---|-----------------------------|---------------|------------------|------------------|---------------------------------|-----------------|----------------|-------|-------|----------------|
| 0 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178           | 7                | Conway           | b Shami                         | 6.0             | 1              | 0.0   | 0.0   | 16.67          |
| 1 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178           | 7                | Ruturaj Gaikwad  | c Shubman Gill b Alzarri Joseph | 50.0            | 92             | 4.0   | 9.0   | 184.00         |
| 2 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178           | 7                | Moeen            | c W Saha b Rashid Khan          | 17.0            | 23             | 4.0   | 1.0   | 135.29         |
| 3 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178           | 7                | Stokes           | c W Saha b Rashid Khan          | 6.0             | 7              | 1.0   | 0.0   | 116.67         |

|      | Date    | Time     | Stadium                | City      | Match Details                                      | Team Playing                | Total Runs | Total Wickets | Batsman Names     | Out/Not Out                    | Balls Played | Runs Scored | Fours | Sixes | Strike Rate |
|------|---------|----------|------------------------|-----------|--|-----------------------------|------------|---------------|-------------------|--------------------------------|--------------|-------------|-------|-------|-------------|
| 4    | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat...  | Chennai Super Kings Innings | 178        | 7             | Rayudu            | b Joshua Little                | 12.0         | 12          | 0.0   | 1.0   | 100.00      |
| ...  | ...     | ...      | ...                    | ...       | ...  | ...                         | ...        | ...           | ...               | ...                            | ...          | ...         | ...   | ...   | ...         |
| 1126 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Shivam Dube       | not out                        | 21.0         | 32          | 0.0   | 2.0   | 152.38      |
| 1127 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ajinkya Rahane    | c Vijay Shankar b Mohit Sharma | 13.0         | 27          | 2.0   | 2.0   | 207.69      |
| 1128 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ambati Rayudu     | c and b Mohit Sharma           | 8.0          | 19          | 1.0   | 2.0   | 237.50      |
| 1129 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | MS Dhoni (c & wk) | c Miller b Mohit Sharma        | 1.0          | 0           | 0.0   | 0.0   | 0.00        |

|      | Date       | Time        | Stadium                      | City      | Match<br>Details   | Team<br>Playing                      | Total<br>Runs | Total<br>Wickets | Batsman<br>Names   | Out/Not<br>Out | Balls<br>Played | Runs<br>Scored | Fours | Sixes | Strike<br>Rate |
|------|------------|-------------|------------------------------|-----------|--|--------------------------------------|---------------|------------------|--------------------|----------------|-----------------|----------------|-------|-------|----------------|
| 1130 | May<br>29, | 07:30<br>PM | Narendra<br>Modi<br>Stadium, | Ahmedabad | Chennai<br>Super<br>Kings<br>vs<br>Gujarat<br>Titans,<br>Final (...) | Chennai<br>Super<br>Kings<br>Innings | 171           | 5                | Ravindra<br>Jadeja | not out        | 6.0             | 15             | 1.0   | 1.0   | 250.00         |

1115 rows × 15 columns

```
In [79]: data.reset_index(drop = True,inplace = True)
```

In [80]: data

Out[80]:

|   | Date    | Time     | Stadium                | City      | Match Details                                     | Team Playing                | Total Runs | Total Wickets | Batsman Names   | Out/Not Out                     | Balls Played | Runs Scored | Fours | Sixes | Strike Rate |
|---|---------|----------|------------------------|-----------|---|-----------------------------|------------|---------------|-----------------|---------------------------------|--------------|-------------|-------|-------|-------------|
| 0 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Conway          | b Shami                         | 6.0          | 1           | 0.0   | 0.0   | 16.67       |
| 1 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Ruturaj Gaikwad | c Shubman Gill b Alzarri Joseph | 50.0         | 92          | 4.0   | 9.0   | 184.00      |
| 2 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Moeen           | c W Saha b Rashid Khan          | 17.0         | 23          | 4.0   | 1.0   | 135.29      |
| 3 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Stokes          | c W Saha b Rashid Khan          | 6.0          | 7           | 1.0   | 0.0   | 116.67      |
| 4 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Rayudu          | b Joshua Little                 | 12.0         | 12          | 0.0   | 1.0   | 100.00      |

|      | Date    | Time     | Stadium                | City      | Match Details                                      | Team Playing                | Total Runs | Total Wickets | Batsman Names     | Out/Not Out                    | Balls Played | Runs Scored | Fours | Sixes | Strike Rate |
|------|---------|----------|------------------------|-----------|--|-----------------------------|------------|---------------|-------------------|--------------------------------|--------------|-------------|-------|-------|-------------|
| ...  | ...     | ...      | ...                    | ...       | ...  | ...                         | ...        | ...           | ...               | ...                            | ...          | ...         | ...   | ...   | ...         |
| 1110 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Shivam Dube       | not out                        | 21.0         | 32          | 0.0   | 2.0   | 152.38      |
| 1111 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ajinkya Rahane    | c Vijay Shankar b Mohit Sharma | 13.0         | 27          | 2.0   | 2.0   | 207.69      |
| 1112 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ambati Rayudu     | c and b Mohit Sharma           | 8.0          | 19          | 1.0   | 2.0   | 237.50      |
| 1113 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | MS Dhoni (c & wk) | c Miller b Mohit Sharma        | 1.0          | 0           | 0.0   | 0.0   | 0.00        |
| 1114 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ravindra Jadeja   | not out                        | 6.0          | 15          | 1.0   | 1.0   | 250.00      |

1115 rows × 15 columns

```
In [81]: # Cheaking for data types
data.dtypes
```

```
Out[81]: Date                object
Time                object
Stadium             object
City                object
Match Details       object
Team Playing        object
Total Runs          int64
Total Wickets       int64
Batsman Names       object
Out/Not Out         object
Balls Played        float64
Runs Scored         object
Fours               float64
Sixes               float64
Strike Rate         float64
dtype: object
```

```
In [82]: data["Balls Played"] = data["Balls Played"].astype(int)
data["Runs Scored"] = data["Runs Scored"].astype(int)
data["Fours"] = data["Fours"].astype(int)
data["Sixes"] = data["Sixes"].astype(int)
```



In [83]: `data.dtypes`

```
Out[83]: Date          object
         Time          object
         Stadium       object
         City          object
         Match Details  object
         Team Playing   object
         Total Runs     int64
         Total Wickets  int64
         Batsman Names  object
         Out/Not Out    object
         Balls Played   int32
         Runs Scored    int32
         Fours          int32
         Sixes          int32
         Strike Rate    float64
         dtype: object
```

In [84]: `new_data = data.copy()`

```
In [85]: team_playes = data[["Team Playing","Batsman Names"]]
team_playes.groupby(by = ["Team Playing","Batsman Names"]).count()
```

Out[85]:

| Team Playing                | Batsman Names     |
|-----------------------------|-------------------|
| Chennai Super Kings Innings | Ajinkya Rahane    |
|                             | Ambati Rayudu     |
|                             | Conway            |
|                             | D Chahar          |
|                             | Devon Conway      |
| ...                         | ...               |
| Sunrisers Hyderabad Innings | Sanvir Singh      |
|                             | Tripathi          |
|                             | Umran Malik       |
|                             | Vivrant Sharma    |
|                             | Washington Sundar |

248 rows × 0 columns

```
In [86]: pd.set_option('display.max.rows',248 )
```

```
In [87]: # Replacing the names of the playes
#Chennai Super Kings Innings
new_data.replace('Conway', 'Devon Conway', inplace = True)
new_data.replace('Dhoni (c & wk)', 'MS Dhoni (c & wk)', inplace = True)
new_data.replace('Moeen', 'Moeen Ali', inplace = True)
new_data.replace('Rayudu', 'Ambati Rayudu', inplace = True)

# Delhi Capitals Innings
new_data.replace('Axar', 'Axar Patel', inplace = True)
new_data.replace('Warner (c)', 'David Warner (c)', inplace = True)
new_data.replace('Warner(c)', 'David Warner (c)', inplace = True)
new_data.replace('Sarfaraz Khan', 'Sarfaraz Khan (wk)', inplace = True)
new_data.replace('Nortje', 'Anrich Nortje', inplace = True)
new_data.replace('Rossouw', 'Rilee Rossouw', inplace = True)
new_data.replace('Salt (wk)', 'Philip Salt (wk)', inplace = True)

# Gujarat Titans Innings
new_data.replace('Miller', 'David Miller', inplace = True)
new_data.replace('W Saha (wk)', 'Wriddhiman Saha (wk)', inplace = True)
new_data.replace('Shami', 'Mohammed Shami', inplace = True)
new_data.replace('Shanaka', 'Dasun Shanaka', inplace = True)

# Kolkata Knight Riders Innings
new_data.replace('Russell', 'Andre Russell', inplace = True)
new_data.replace('Chakaravarthy', 'Varun Chakaravarthy', inplace = True)
new_data.replace('Wiese', 'David Wiese', inplace = True)
new_data.replace('Gurbaz (wk)', 'Rahmanullah Gurbaz (wk)', inplace = True)
new_data.replace('Mandeep', 'Mandeep Singh', inplace = True)
new_data.replace('N Jagadeesan', 'N Jagadeesan (wk)', inplace = True)
new_data.replace('Narine', 'Sunil Narine', inplace = True)
new_data.replace('Thakur', 'Shardul Thakur', inplace = True)
new_data.replace('Umesh', 'Umesh Yadav', inplace = True)

# Lucknow Super Giants Innings
new_data.replace('Krunal Pandya', 'Krunal Pandya (c)', inplace = True)
new_data.replace('Nicholas Pooran', 'Nicholas Pooran (wk)', inplace = True)
new_data.replace('Pooran', 'Nicholas Pooran (wk)', inplace = True)
new_data.replace('Pooran (wk)', 'Nicholas Pooran (wk)', inplace = True)
new_data.replace('de Kock (wk)', 'Quinton de Kock (wk)', inplace = True)
```

```
new_data.replace('Rahul (c)', 'KL Rahul (c)', inplace = True)
new_data.replace('Stoinis', 'Marcus Stoinis', inplace = True)
new_data.replace('K Gowtham', 'Krishnappa Gowtham', inplace = True)
new_data.replace('K Mayers', 'Kyle Mayers', inplace = True)
new_data.replace('K Mayers', 'Kyle Mayers', inplace = True)

# Mumbai Indians Innings
new_data.replace('Green', 'Cameron Green', inplace = True)
new_data.replace('Chawla', 'Piyush Chawla', inplace = True)
new_data.replace('Rohit (c)', 'Rohit Sharma (c)', inplace = True)
new_data.replace('Rohit Sharma', 'Rohit Sharma (c)', inplace = True)
new_data.replace('Suryakumar Yadav (c)', 'Suryakumar Yadav', inplace = True)

# Punjab Kings Innings
new_data.replace('Harpreet Singh', 'Harpreet Singh Bhatia', inplace = True)
new_data.replace('Livingstone', 'Liam Livingstone', inplace = True)
new_data.replace('Prabhsimran', 'Prabhsimran Singh', inplace = True)
new_data.replace('Sam Curran (c)', 'Sam Curran', inplace = True)
new_data.replace('Dhawan (c)', 'Shikhar Dhawan (c)', inplace = True)
new_data.replace('Raza', 'Sikandar Raza', inplace = True)

# Rajasthan Royals Innings
new_data.replace('Holder', 'Jason Holder', inplace = True)
new_data.replace('Padikkal', 'Devdutt Padikkal', inplace = True)
new_data.replace('Ashwin', 'Ravichandran Ashwin', inplace = True)
new_data.replace('Samsom(c & WK)', 'Sanju Samson (c & wk)', inplace = True)
new_data.replace('Samson (c & wk)', 'Sanju Samson (c & wk)', inplace = True)
new_data.replace('Hetmyer', 'Shimron Hetmyer', inplace = True)
new_data.replace('Boult', 'Trent Boult', inplace = True)
new_data.replace('Zampa', 'Adam Zampa', inplace = True)

# Royal Challengers Bangalore Innings
new_data.replace('Anuj Rawat', 'Anuj Rawat (wk)', inplace = True)
new_data.replace('Karthik', 'Dinesh Karthik (wk)', inplace = True)
new_data.replace('Karthik (wk)', 'Dinesh Karthik (wk)', inplace = True)
new_data.replace('Kohli', 'Virat Kohli', inplace = True)
new_data.replace('Kohli (c)', 'Virat Kohli', inplace = True)
new_data.replace('Lomror', 'Mahipal Lomror', inplace = True)
new_data.replace('M Bracewell', 'Michael Bracewell', inplace = True)
new_data.replace('Prabhudessai', 'Suyash Prabhudessai', inplace = True)
new_data.replace('du Plessis', 'Faf du Plessis (c)', inplace = True)
new_data.replace('du Plessis', 'Faf du Plessis (c)', inplace = True)
```

```
new_data.replace('Willey', 'David Willey', inplace = True)
new_data.replace('Maxwell', 'Glenn Maxwell', inplace = True)
new_data.replace('Maxwell', 'Glenn Maxwell', inplace = True)

# Sunrisers Hyderabad Innings
new_data.replace('Bhuvneshwar Kumar (c)', 'Bhuvneshwar Kumar', inplace = True)
new_data.replace('Bhuvneshwar', 'Bhuvneshwar Kumar', inplace = True)
new_data.replace('Glenn Phillips', 'Glenn Phillips (wk)', inplace = True)
new_data.replace('Anmolpreet Singh (wk)', 'Anmolpreet Singh', inplace = True)
new_data.replace('Klaasen (wk)', 'Heinrich Klaasen', inplace = True)
new_data.replace('Markram (c)', 'Aiden Markram (c)', inplace = True)
new_data.replace('Tripathi', 'Rahul Tripathi', inplace = True)
```

In [88]: new\_data

Out[88]:

|   | Date    | Time     | Stadium                | City      | Match Details                                     | Team Playing                | Total Runs | Total Wickets | Batsman Names   | Out/Not Out                     | Balls Played | Runs Scored | Fours | Sixes | Strike Rate |
|---|---------|----------|------------------------|-----------|---|-----------------------------|------------|---------------|-----------------|---------------------------------|--------------|-------------|-------|-------|-------------|
| 0 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Devon Conway    | b Shami                         | 6            | 1           | 0     | 0     | 16.67       |
| 1 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Ruturaj Gaikwad | c Shubman Gill b Alzarri Joseph | 50           | 92          | 4     | 9     | 184.00      |
| 2 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Moeen Ali       | c W Saha b Rashid Khan          | 17           | 23          | 4     | 1     | 135.29      |
| 3 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Stokes          | c W Saha b Rashid Khan          | 6            | 7           | 1     | 0     | 116.67      |
| 4 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Chennai Super Kings Innings | 178        | 7             | Ambati Rayudu   | b Joshua Little                 | 12           | 12          | 0     | 1     | 100.00      |

|      | Date    | Time     | Stadium                | City      | Match Details                                      | Team Playing                | Total Runs | Total Wickets | Batsman Names     | Out/Not Out                    | Balls Played | Runs Scored | Fours | Sixes | Strike Rate |
|------|---------|----------|------------------------|-----------|--|-----------------------------|------------|---------------|-------------------|--------------------------------|--------------|-------------|-------|-------|-------------|
| ...  | ...     | ...      | ...                    | ...       | ...  | ...                         | ...        | ...           | ...               | ...                            | ...          | ...         | ...   | ...   | ...         |
| 1110 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Shivam Dube       | not out                        | 21           | 32          | 0     | 2     | 152.38      |
| 1111 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ajinkya Rahane    | c Vijay Shankar b Mohit Sharma | 13           | 27          | 2     | 2     | 207.69      |
| 1112 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ambati Rayudu     | c and b Mohit Sharma           | 8            | 19          | 1     | 2     | 237.50      |
| 1113 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | MS Dhoni (c & wk) | c Miller b Mohit Sharma        | 1            | 0           | 0     | 0     | 0.00        |
| 1114 | May 29, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Chennai Super Kings vs Gujarat Titans, Final (...) | Chennai Super Kings Innings | 171        | 5             | Ravindra Jadeja   | not out                        | 6            | 15          | 1     | 1     | 250.00      |

1115 rows × 15 columns

```
In [89]: new_team_players = new_data[["Team Playing", "Batsman Names"]]  
new_team_players.groupby(by = ["Team Playing", "Batsman Names"]).count()
```

Out[89]:

| Team Playing                | Batsman Names     |
|-----------------------------|-------------------|
| Chennai Super Kings Innings | Ajinkya Rahane    |
|                             | Ambati Rayudu     |
|                             | D Chahar          |
|                             | Devon Conway      |
|                             | MS Dhoni (c & wk) |
|                             | Moeen Ali         |
|                             | Ravindra Jadeja   |
|                             | Ruturaj Gaikwad   |
|                             | Santner           |
|                             | Shivam Dube       |
|                             | Stokes            |

```
In [90]: pd.set_option('display.max.rows',248 )
```

## Top Fours



```
In [91]: Top_Fours = new_data[["Batsman Names", "Fours"]]  
Top_Fours
```

Out[91]:

|      | Batsman Names     | Fours |
|------|-------------------|-------|
| 0    | Devon Conway      | 0     |
| 1    | Ruturaj Gaikwad   | 4     |
| 2    | Moeen Ali         | 4     |
| 3    | Stokes            | 1     |
| 4    | Ambati Rayudu     | 0     |
| ...  | ...               | ...   |
| 1110 | Shivam Dube       | 0     |
| 1111 | Ajinkya Rahane    | 2     |
| 1112 | Ambati Rayudu     | 1     |
| 1113 | MS Dhoni (c & wk) | 0     |
| 1114 | Ravindra Jadeja   | 1     |

1115 rows × 2 columns

```
In [92]: Top_Fours_Byplayers = Top_Fours.groupby("Batsman Names").sum()  
Top_Fours_Byplayers
```

Out[92]:

|                    | Fours |
|--------------------|-------|
| Batsman Names      |       |
| Abdul Basith       | 0     |
| Abdul Samad        | 10    |
| Abhinav Manohar    | 6     |
| Abhishek Sharma    | 25    |
| Abishek Porel (wk) | 1     |
| Adam Zampa         | 0     |
| Adil Rashid        | 2     |
| Aiden Markram (c)  | 16    |
| Ajinkya Rahane     | 24    |
| Akash Deep         | 2     |

```
In [93]: Fours = Top_Fours_Byplayers.sort_values("Fours",ascending = False).reset_index().head(10)
Fours
```

Out[93]:

|   | Batsman Names        | Fours |
|---|----------------------|-------|
| 0 | Yashasvi Jaiswal     | 79    |
| 1 | Shubman Gill         | 78    |
| 2 | Devon Conway         | 77    |
| 3 | David Warner (c)     | 69    |
| 4 | Virat Kohli          | 59    |
| 5 | Suryakumar Yadav     | 58    |
| 6 | Ishan Kishan (wk)    | 54    |
| 7 | Shikhar Dhawan (c)   | 49    |
| 8 | Ruturaj Gaikwad      | 46    |
| 9 | Wriddhiman Saha (wk) | 44    |

## Top Six

```
In [94]: Top_six = new_data[["Batsman Names","Sixes"]]
six = Top_six.groupby("Batsman Names").sum().reset_index()
```

In [95]:

six

Out[95]:

|    | Batsman Names      | Sixes |
|----|--------------------|-------|
| 0  | Abdul Basith       | 0     |
| 1  | Abdul Samad        | 11    |
| 2  | Abhinav Manohar    | 7     |
| 3  | Abhishek Sharma    | 4     |
| 4  | Abishek Porel (wk) | 2     |
| 5  | Adam Zampa         | 0     |
| 6  | Adil Rashid        | 1     |
| 7  | Aiden Markram (c)  | 3     |
| 8  | Ajinkya Rahane     | 16    |
| 9  | Akash Deep         | 1     |
| 10 | Akeal Hosein       | 1     |

```
In [96]: Top_sixes = six.sort_values("Sixes",ascending = False).head(10).reset_index()  
Top_sixes
```

Out[96]:

|   | index | Batsman Names         | Sixes |
|---|-------|-----------------------|-------|
| 0 | 146   | Shivam Dube           | 35    |
| 1 | 46    | Glenn Maxwell         | 31    |
| 2 | 133   | Ruturaj Gaikwad       | 30    |
| 3 | 87    | Marcus Stoinis        | 27    |
| 4 | 152   | Suryakumar Yadav      | 26    |
| 5 | 105   | Nicholas Pooran (wk)  | 25    |
| 6 | 126   | Rinku Singh           | 24    |
| 7 | 176   | Yashasvi Jaiswal      | 24    |
| 8 | 137   | Sanju Samson (c & wk) | 24    |
| 9 | 147   | Shubman Gill          | 23    |

## Total Teams

```
In [97]: new_data[["Team Playing"]].groupby(by=["Team Playing"]).count().reset_index()
```

Out[97]:

|   | Team Playing                        |
|---|-------------------------------------|
| 0 | Chennai Super Kings Innings         |
| 1 | Delhi Capitals Innings              |
| 2 | Gujarat Titans Innings              |
| 3 | Kolkata Knight Riders Innings       |
| 4 | Lucknow Super Giants Innings        |
| 5 | Mumbai Indians Innings              |
| 6 | Punjab Kings Innings                |
| 7 | Rajasthan Royals Innings            |
| 8 | Royal Challengers Bangalore Innings |
| 9 | Sunrisers Hyderabad Innings         |

## Highest Team Scores

```
In [98]: Highest_Team_Scores = new_data[["Team Playing", "Total Runs"]].groupby(by = ["Team Playing"]).max().sort_values(Highest_Team_Scores)
```

Out[98]:

|   | Team Playing                        | Total Runs |
|---|-------------------------------------|------------|
| 0 | Lucknow Super Giants Innings        | 257        |
| 1 | Chennai Super Kings Innings         | 235        |
| 2 | Gujarat Titans Innings              | 227        |
| 3 | Mumbai Indians Innings              | 218        |
| 4 | Royal Challengers Bangalore Innings | 218        |
| 5 | Sunrisers Hyderabad Innings         | 217        |
| 6 | Punjab Kings Innings                | 214        |
| 7 | Rajasthan Royals Innings            | 214        |
| 8 | Delhi Capitals Innings              | 213        |
| 9 | Kolkata Knight Riders Innings       | 207        |

## Runs\_Scored\_ByPlayers

```
In [99]: Runs_Scored = new_data[["Batsman Names", "Runs Scored"]].groupby(by = ["Batsman Names"]).sum().sort_values("Runs_Scored")
```

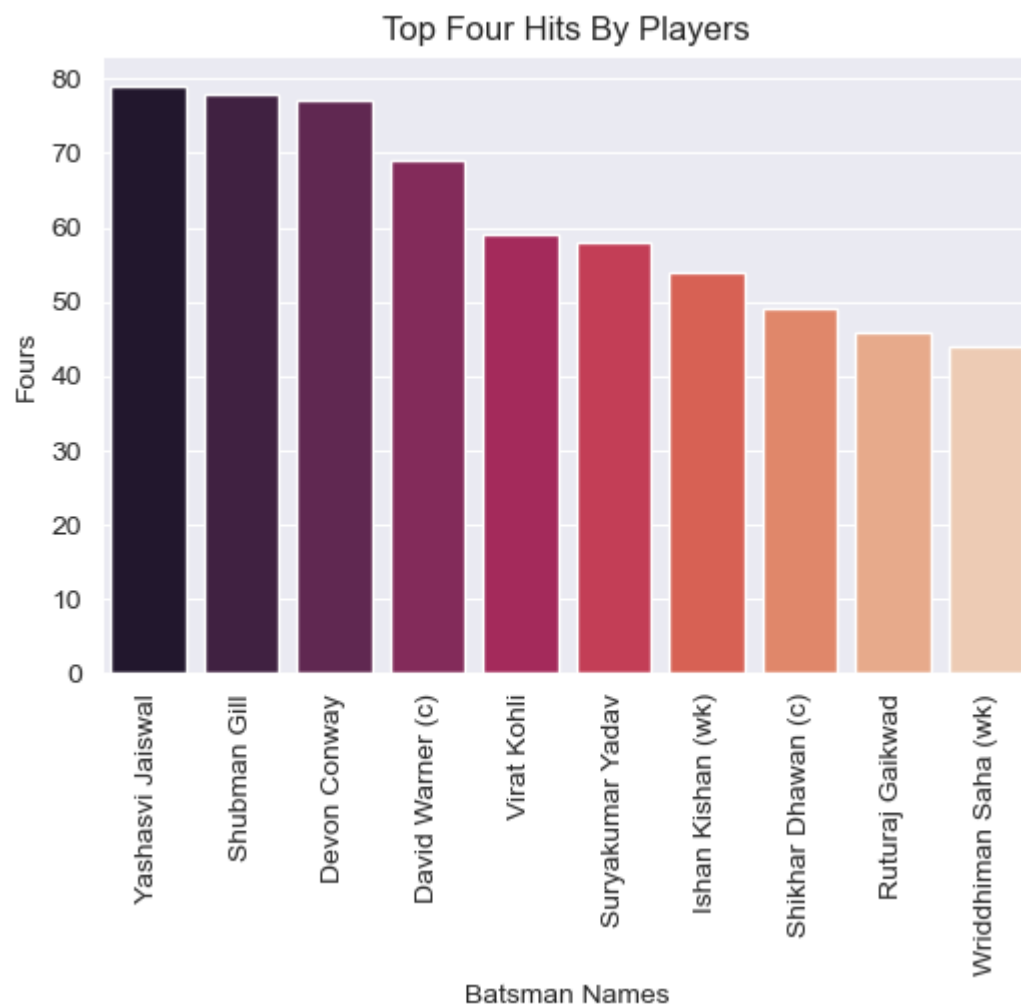
Out[99]:

|   | Batsman Names     | Runs Scored |
|---|-------------------|-------------|
| 0 | Shubman Gill      | 761         |
| 1 | Devon Conway      | 672         |
| 2 | Ruturaj Gaikwad   | 590         |
| 3 | Virat Kohli       | 585         |
| 4 | Yashasvi Jaiswal  | 581         |
| 5 | Suryakumar Yadav  | 544         |
| 6 | David Warner (c)  | 516         |
| 7 | Ishan Kishan (wk) | 454         |
| 8 | Cameron Green     | 422         |
| 9 | Shivam Dube       | 418         |

## Graphical representation

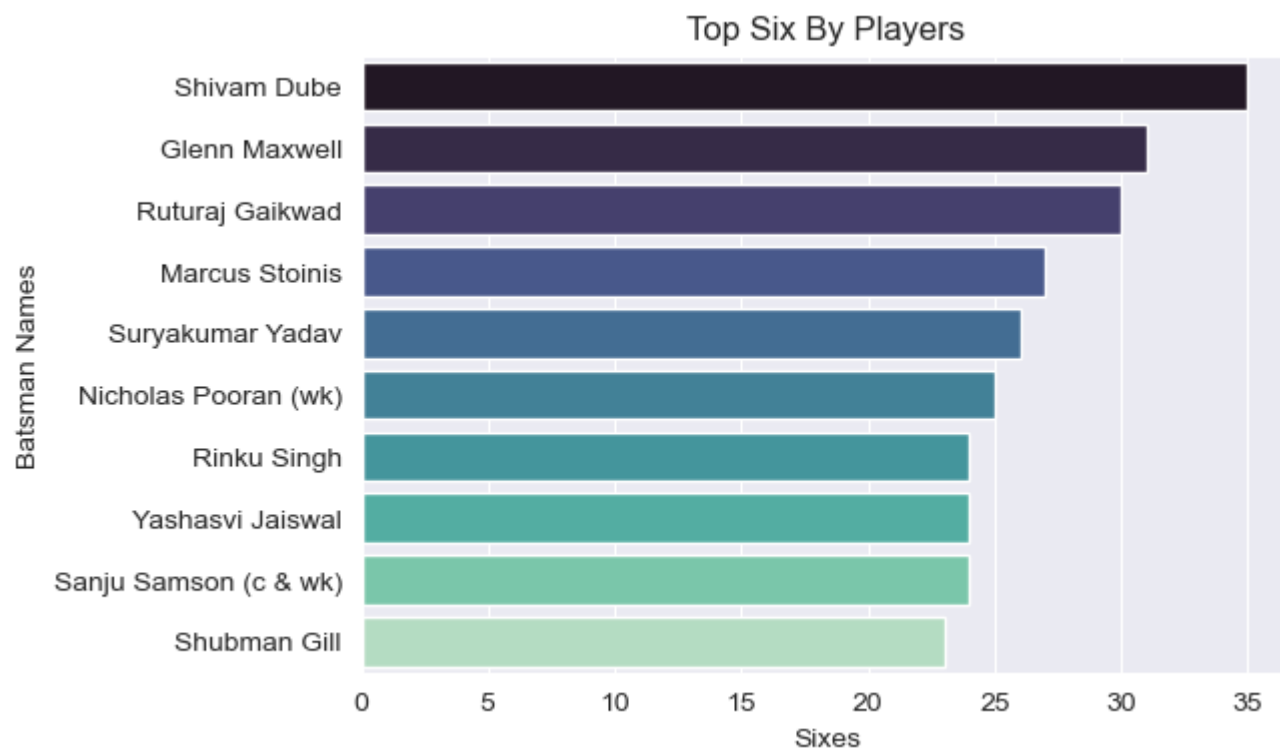


```
In [100]: plt.figure(figsize = (6,4))
sns.set_style("darkgrid")
ax=sns.barplot(x =Fours['Batsman Names'],y = Fours['Fours'],palette ="rocket",errorbar=('ci', False))
ax.set_xticklabels(ax.get_xticklabels(),rotation = 90)
plt.title("Top Four Hits By Players")
plt.show()
```



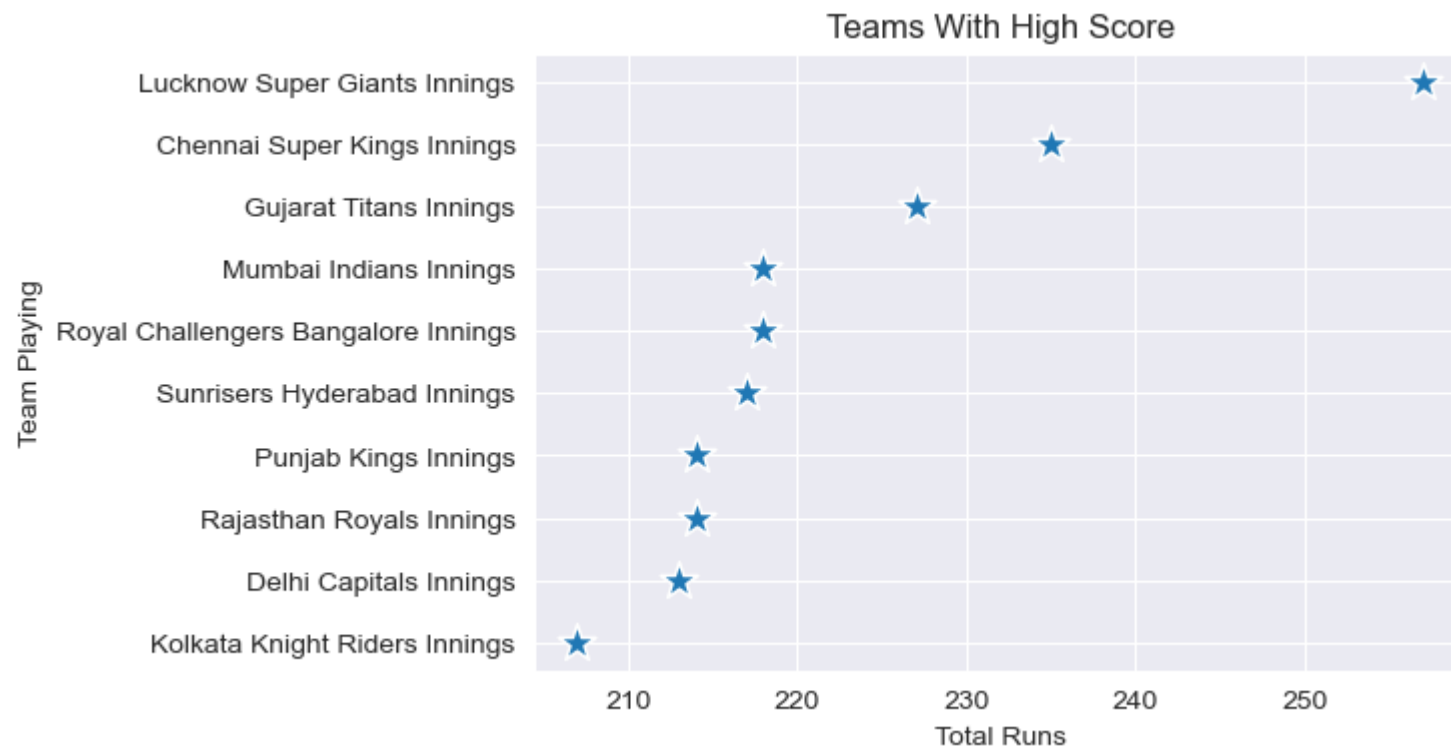
In [101]:

```
plt.figure(figsize = (6,4))
sns.barplot(x = Top_sixes["Sixes"],y = Top_sixes["Batsman Names"],palette = "mako",errorbar=('ci', False))
plt.title("Top Six By Players")
plt.show()
```



```
In [102]: plt.figure(figsize = (6,4))
sns.set_style("darkgrid")
#sns.set(rc={'axes.facecolor':'lightblue', 'figure.facecolor':'lightgreen'})
sns.scatterplot(x = Highest_Team_Scores['Total Runs'],y=Highest_Team_Scores['Team Playing'],marker = "*",s = 100)
plt.title("Teams With High Score")

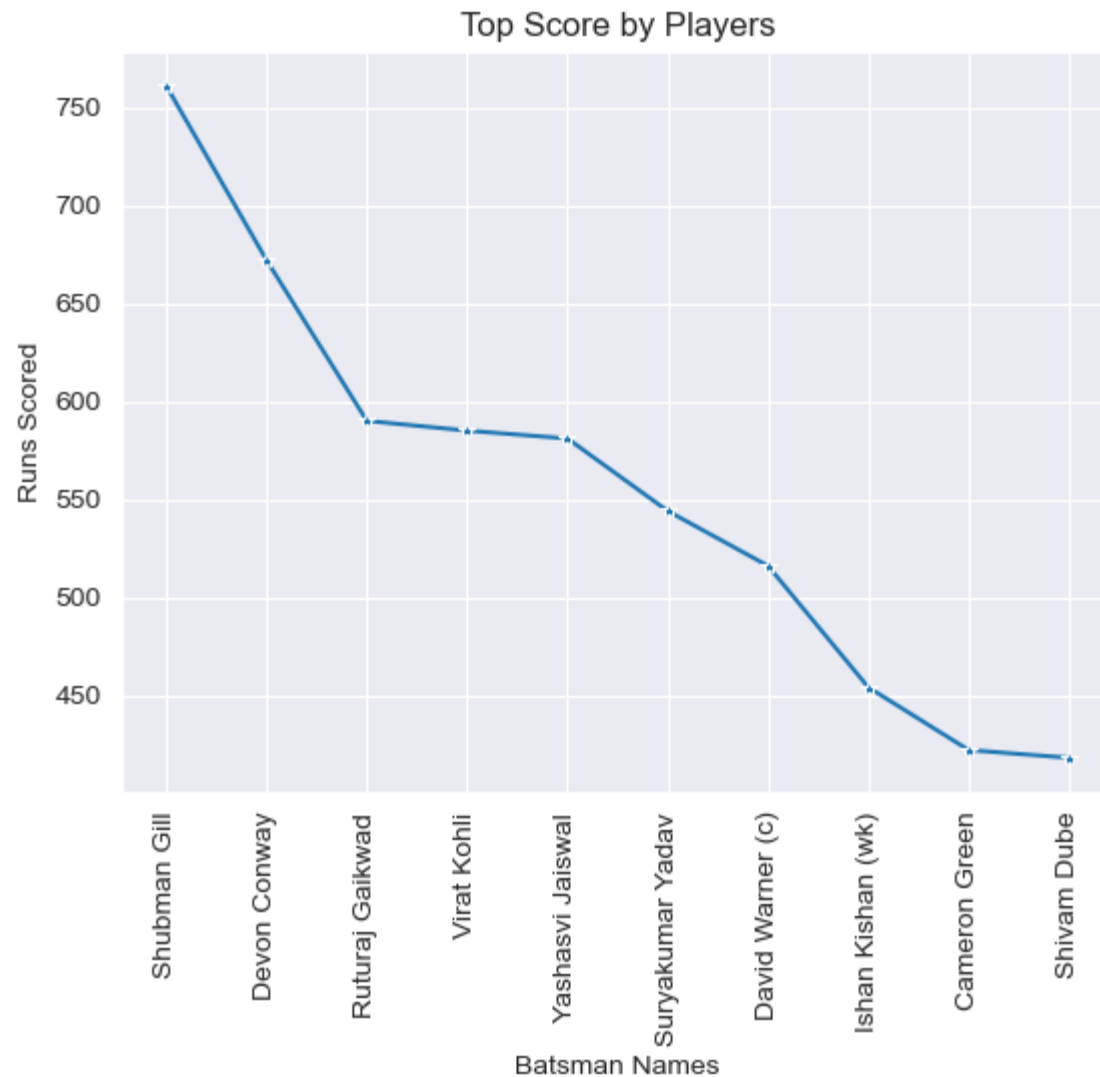
plt.show()
```



```
In [103]: ab=sns.lineplot(x = Runs_Scored["Batsman Names"],y = Runs_Scored['Runs Scored'],marker = "*")
ab.set_xticklabels(ab.get_xticklabels(),rotation = 90)
plt.title("Top Score by Players")
plt.show()
```

C:\Users\Vasu Prasad\AppData\Local\Temp\ipykernel\_8488\958133767.py:2: UserWarning: FixedFormatter should only be used together with FixedLocator

```
ab.set_xticklabels(ab.get_xticklabels(),rotation = 90)
```



## Bowling Data

```
In [104]: B_data=pd.read_csv("file:///C:/Users/Vasu%20Prasad/OneDrive/Documents/MCA/IPL_Project/Dataset/2023/bowling_sur
```

```
In [105]: B_data.head()
```

Out[105]:

|   | Unnamed: 0 | Date    | Time     | Stadium                | City      | Match Details                                     | Team Bowling           | Total Runs Conceeded | Total Wickets Taken | Bowler Name       | Overs | Maidens | Runs | Wickets | N Bal |
|---|------------|---------|----------|------------------------|-----------|---|------------------------|----------------------|---------------------|-------------------|-------|---------|------|---------|-------|
| 0 | 0          | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Gujarat Titans Innings | 178                  | 7                   | Shami             | 4.0   | 0.0     | 29.0 | 2.0     |       |
| 1 | 1          | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Gujarat Titans Innings | 178                  | 7                   | Hardik Pandya (c) | 3.0   | 0.0     | 28.0 | 0.0     |       |
|   |            |         |          |                        |           | Gujarat   |                        |                      |                     |                   |       |         |      |         |       |

In [106]: `B_data.describe()`

Out[106]:

|              | Unnamed:<br>0 | Total Runs<br>Conceded | Total Wickets<br>Taken | Overs      | Maidens    | Runs       | Wickets    | No Balls   | Wides      | Economies  |
|--------------|---------------|------------------------|------------------------|------------|------------|------------|------------|------------|------------|------------|
| <b>count</b> | 761.000000    | 761.000000             | 761.000000             | 758.000000 | 759.000000 | 760.000000 | 760.000000 | 761.000000 | 759.000000 | 761.000000 |
| <b>mean</b>  | 380.000000    | 174.943495             | 6.152431               | 3.157520   | 0.017128   | 28.067105  | 0.940789   | 0.103811   | 0.814229   | 9.202628   |
| <b>std</b>   | 219.826068    | 31.137568              | 2.347540               | 1.048363   | 0.129833   | 11.513272  | 1.026869   | 0.367780   | 1.349683   | 3.412754   |
| <b>min</b>   | 0.000000      | 101.000000             | 1.000000               | 0.100000   | 0.000000   | 0.000000   | 0.000000   | 0.000000   | 0.000000   | 0.000000   |
| <b>25%</b>   | 190.000000    | 150.000000             | 4.000000               | 2.625000   | 0.000000   | 20.000000  | 0.000000   | 0.000000   | 0.000000   | 7.000000   |
| <b>50%</b>   | 380.000000    | 178.000000             | 6.000000               | 4.000000   | 0.000000   | 28.000000  | 1.000000   | 0.000000   | 0.000000   | 8.800000   |
| <b>75%</b>   | 570.000000    | 199.000000             | 8.000000               | 4.000000   | 0.000000   | 36.000000  | 2.000000   | 0.000000   | 1.000000   | 11.000000  |
| <b>max</b>   | 760.000000    | 257.000000             | 10.000000              | 4.000000   | 1.000000   | 69.000000  | 5.000000   | 3.000000   | 10.000000  | 26.000000  |

```
In [107]: B_data.isnull().sum().reset_index().rename(columns = {0:"count"})
```

Out[107]:

|    | index                | count |
|----|----------------------|-------|
| 0  | Unnamed: 0           | 0     |
| 1  | Date                 | 0     |
| 2  | Time                 | 0     |
| 3  | Stadium              | 0     |
| 4  | City                 | 0     |
| 5  | Match Details        | 0     |
| 6  | Team Bowling         | 0     |
| 7  | Total Runs Conceeded | 0     |
| 8  | Total Wickets Taken  | 0     |
| 9  | Bowler Name          | 5     |
| 10 | Overs                | 3     |
| 11 | Maidens              | 2     |
| 12 | Runs                 | 1     |
| 13 | Wickets              | 1     |
| 14 | No Balls             | 0     |
| 15 | Wides                | 2     |
| 16 | Economies            | 0     |

```
In [108]: B_data[B_data["Bowler Name"].isna() | B_data["Overs"].isna() | B_data["Maidens"].isna() | B_data["Runs"].isna()
```

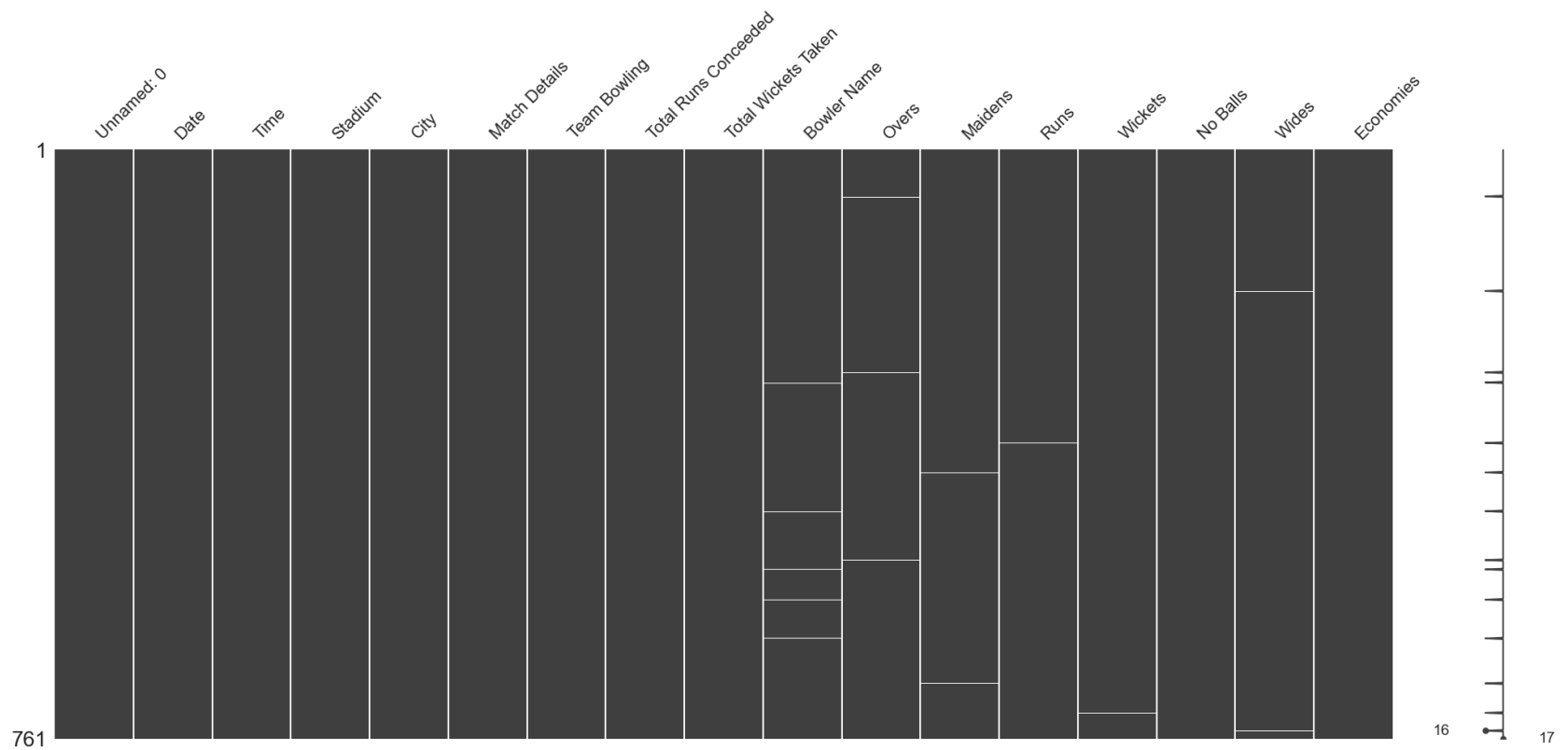
```
Out[108]:
```

|     | Unnamed: 0 | Date    | Time     | Stadium                 | City    | Match Details                                     | Team Bowling                 | Total Runs Conceded | Total Wickets Taken | Bowler Name   | Overs | Maidens |
|-----|------------|---------|----------|-------------------------|---------|---|------------------------------|---------------------|---------------------|---------------|-------|---------|
| 61  | 61         | Apr 03, | 07:30 PM | MA Chidambaram Stadium, | Chennai | Chennai Super Kings vs Lucknow Super Giants, 6... | Lucknow Super Giants Innings | 217                 | 7                   | Krunal Pandya | NaN   | 0.0     |
| 183 | 183        | Apr 12, | 07:30 PM | MA Chidambaram Stadium, | Chennai | Chennai Super Kings vs Rajasthan Royals, 17th ... | Chennai Super Kings Innings  | 175                 | 8                   | M Theekshana  | 4.0   | 0.0     |
| 288 | 288        | Apr 20, | 07:30 PM | Arun Jaitley Stadium,   | Delhi   | Delhi Capitals vs Kolkata Knight Riders           | Delhi Capitals Innings       | 127                 | 10                  | Ishant        | NaN   | 0.0     |



```
In [109]: msno.matrix(B_data)
```

```
Out[109]: <Axes: >
```



```
In [110]: pd.set_option('display.max.rows',761)
```

```
In [111]: B_data.at[301,"Bowler Name"]
```

```
Out[111]: nan
```

```
In [112]: B_data.at[301,"Bowler Name"] = "Akash Singh"
```

```
In [113]: B_data.at[467,"Bowler Name"]
```

```
Out[113]: nan
```

```
In [114]: B_data.at[467,"Bowler Name"] = "Green"
```

```
In [115]: B_data.at[542,"Bowler Name"]
```

```
Out[115]: nan
```

```
In [116]: B_data.at[542,"Bowler Name"] = "Vaibhav Arora"
```

```
In [117]: B_data.at[581,"Bowler Name"]
```

```
Out[117]: nan
```

```
In [118]: B_data.at[581,"Bowler Name"] = "Shami"
```

```
In [119]: B_data.at[631,"Bowler Name"]
```

```
Out[119]: nan
```

```
In [120]: B_data.at[631,"Bowler Name"] = "Behrendorff"
```

```
In [121]: B_data.at[61,"Overs"]
```

```
Out[121]: nan
```

```
In [122]: B_data.at[61,"Overs"] = 2
```

```
In [123]: B_data.at[288,"Overs"]
```

```
Out[123]: nan
```

```
In [124]: B_data.at[288,"Overs"] = 4
```

```
In [125]: B_data.at[530,"Overs"]
```

```
Out[125]: nan
```

```
In [126]: B_data.at[530,"Overs"] = 4
```

```
In [127]: B_data.at[417, "Maidens"]
```

```
Out[127]: nan
```

```
In [128]: B_data.at[417, "Maidens"] = 0
```

```
In [129]: B_data.at[689, "Maidens"]
```

```
Out[129]: nan
```

```
In [130]: B_data.at[689, "Maidens"] = 0
```

```
In [131]: B_data.at[379, "Runs"]
```

```
Out[131]: nan
```

```
In [132]: B_data.at[379, "Runs"] = 25
```

```
In [133]: B_data.at[727, "Wickets"]
```

```
Out[133]: nan
```

```
In [134]: B_data.at[727, "Wickets"] = 0
```

```
In [135]: B_data.at[183, "Wides"]
```

```
Out[135]: nan
```

```
In [136]: B_data.at[183, "Wides"] = 0
```

```
In [137]: B_data.at[750, "Wides"]
```

```
Out[137]: nan
```

```
In [138]: B_data.at[750, "Wides"] = 0
```

In [139]: B\_data

Out[139]:

| Unnamed: 0 | Date | Time    | Stadium  | City                   | Match Details | Team Bowling                                      | Total Runs Conceeded   | Total Wickets Taken | Bowler Name | Overs             | Maidens |     |
|------------|------|---------|----------|------------------------|---------------|---|------------------------|---------------------|-------------|-------------------|---------|-----|
| 0          | 0    | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad     | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Gujarat Titans Innings | 178                 | 7           | Shami             | 4.0     | 0.0 |
| 1          | 1    | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad     | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Gujarat Titans Innings | 178                 | 7           | Hardik Pandya (c) | 3.0     | 0.0 |
| 2          | 2    | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad     | Gujarat Titans vs Chennai Super Kings, 1st        | Gujarat Titans Innings | 178                 | 7           | Joshua Little     | 4.0     | 0.0 |

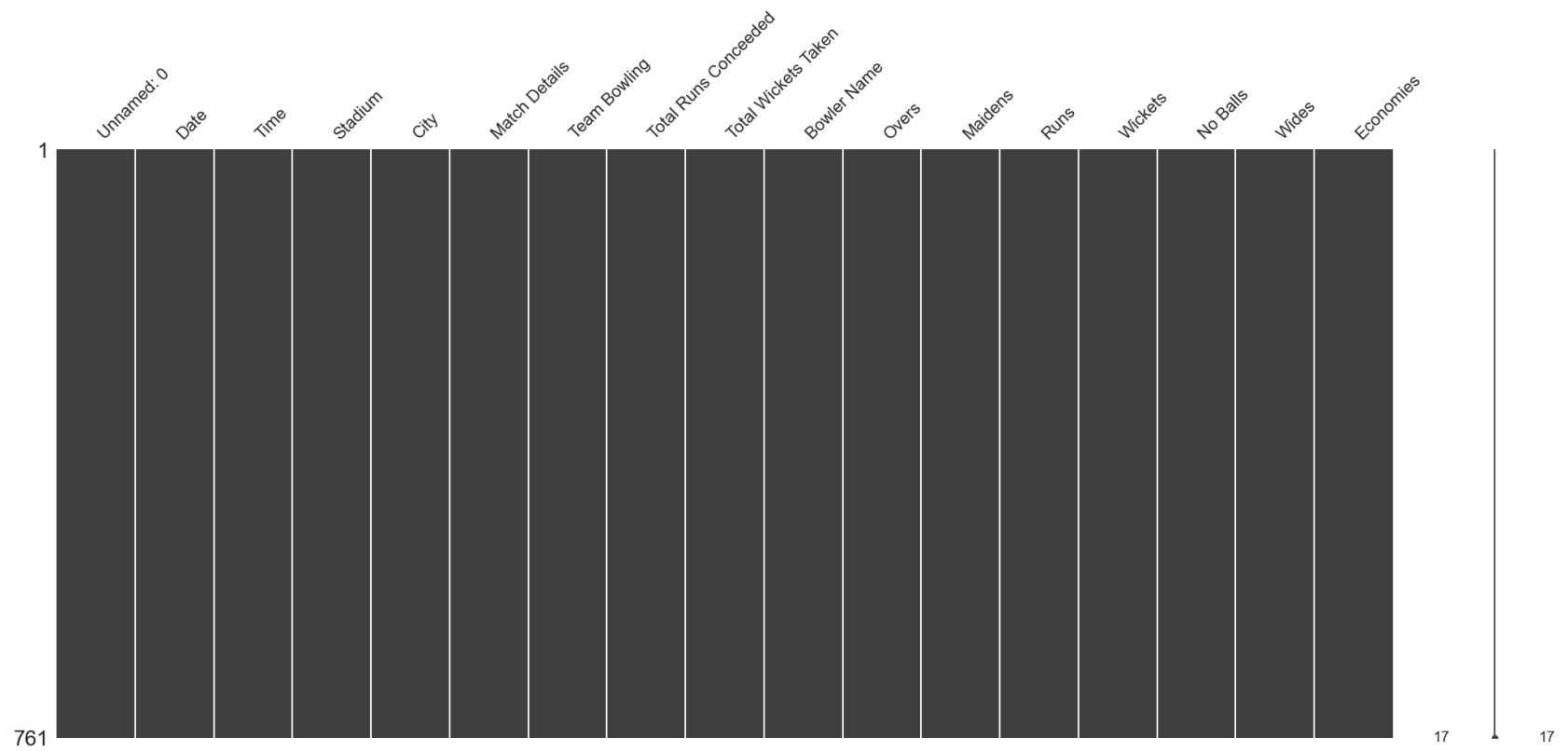
```
In [140]: B_data.isnull().sum().reset_index().rename(columns = {0:"count"})
```

Out[140]:

|    | index                | count |
|----|----------------------|-------|
| 0  | Unnamed: 0           | 0     |
| 1  | Date                 | 0     |
| 2  | Time                 | 0     |
| 3  | Stadium              | 0     |
| 4  | City                 | 0     |
| 5  | Match Details        | 0     |
| 6  | Team Bowling         | 0     |
| 7  | Total Runs Conceeded | 0     |
| 8  | Total Wickets Taken  | 0     |
| 9  | Bowler Name          | 0     |
| 10 | Overs                | 0     |
| 11 | Maidens              | 0     |
| 12 | Runs                 | 0     |
| 13 | Wickets              | 0     |
| 14 | No Balls             | 0     |
| 15 | Wides                | 0     |
| 16 | Economies            | 0     |

```
In [141]: msno.matrix(B_data)
```

```
Out[141]: <Axes: >
```



```
In [142]: B_data.dtypes
```

```
Out[142]: Unnamed: 0          int64
Date          object
Time          object
Stadium       object
City          object
Match Details object
Team Bowling  object
Total Runs Conceded  int64
Total Wickets Taken  int64
Bowler Name    object
Overs          float64
Maidens        float64
Runs           float64
Wickets        float64
No Balls       int64
Wides          float64
Economies      float64
dtype: object
```

```
In [143]: B_data[["Overs"]] = B_data[["Overs"]].astype(int)
B_data[["Maidens"]] = B_data[["Maidens"]].astype(int)
B_data[["Economies"]] = B_data[["Economies"]].astype(int)
B_data[["Wides"]] = B_data[["Wides"]].astype(int)
B_data[["Runs"]] = B_data[["Runs"]].astype(int)
B_data[["Wickets"]] = B_data[["Wickets"]].astype(int)
```

```
In [144]: B_data.dtypes
```

```
Out[144]: Unnamed: 0          int64  
Date          object  
Time          object  
Stadium       object  
City          object  
Match Details object  
Team Bowling  object  
Total Runs Conceded  int64  
Total Wickets Taken  int64  
Bowler Name    object  
Overs          int32  
Maidens        int32  
Runs           int32  
Wickets        int32  
No Balls       int64  
Wides          int32  
Economies      int32  
dtype: object
```

```
In [145]: B_data.shape
```

```
Out[145]: (761, 17)
```

```
In [146]: B_data.drop("Unnamed: 0",axis = 1,inplace = True)
```



In [147]: B\_data

Out[147]:

|   | Date    | Time     | Stadium                | City      | Match Details                                     | Team Bowling           | Total Runs Conceeded | Total Wickets Taken | Bowler Name       | Overs | Maidens | Runs | Wic |
|---|---------|----------|------------------------|-----------|---|------------------------|----------------------|---------------------|-------------------|-------|---------|------|-----|
| 0 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Gujarat Titans Innings | 178                  | 7                   | Shami             | 4     | 0       | 29   |     |
| 1 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kings, 1st Mat... | Gujarat Titans Innings | 178                  | 7                   | Hardik Pandya (c) | 3     | 0       | 28   |     |
| 2 | Mar 31, | 07:30 PM | Narendra Modi Stadium, | Ahmedabad | Gujarat Titans vs Chennai Super Kinas 1st         | Gujarat Titans Innings | 178                  | 7                   | Joshua Little     | 4     | 0       | 41   |     |

In [148]: B\_data.columns

Out[148]: Index(['Date', 'Time', 'Stadium', 'City', 'Match Details', 'Team Bowling', 'Total Runs Conceeded', 'Total Wickets Taken', 'Bowler Name', 'Overs', 'Maidens', 'Runs', 'Wickets', 'No Balls', 'Wides', 'Economies'], dtype='object')

```
In [149]: Team_Bowlers = B_data[["Team Bowling", "Bowler Name"]]  
Team_Bowlers.groupby(by = ["Team Bowling", "Bowler Name"]).count()
```

Out[149]:

| Team Bowling                | Bowler Name         |
|-----------------------------|---------------------|
| Chennai Super Kings Innings | Akash Singh         |
|                             | Ben Stokes          |
|                             | D Chahar            |
|                             | Deepak Chahar       |
|                             | M Theekshana        |
|                             | Magala              |
|                             | Maheesh Theekshana  |
|                             | Matheesha Pathirana |
|                             | Mitchell Santner    |
|                             | Moeen               |
|                             | Moeen Ali           |

In [150]: *#updating the team players names*

```
B_data["Bowler Name"].replace({'D Chahar':'Deepak Chahar','Moeen':'Moeen Ali',  
                                'M Theekshana':'Maheesh Theekshana',  
                                'RS Hangargekar':'Rajvardhan Hangargekar',  
                                'Santner':'Mitchell Santner',  
                                'Axar':'Axar Patel',  
                                'Ishant':'Ishant Sharma',  
                                'Nortje':'Anrich Nortje',  
                                'Rashid Khan':'Rashid Khan (c)',  
                                'Shami':'Mohammed Shami',  
                                'Russell':'Andre Russell',  
                                'Narine':'Sunil Narine',  
                                'Southee':'Tim Southee',  
                                'Umesh':'Umesh Yadav',  
                                'Chakaravarthy':'Varun Chakaravarthy',  
                                'Thakur':'Shardul Thakur',  
                                'Krunal Pandya':'Krunal Pandya (c)',  
                                'K Mayers':'Kyle Mayers',  
                                'Green':'Cameron Green',  
                                'Chawla':'Piyush Chawla',  
                                'Livingstone':'Liam Livingstone',  
                                'Sam Curran':'Sam Curran (c)',  
                                'Raza':'Sikandar Raza',  
                                'Rabada':'Kagiso Rabada',  
                                'Holder':'Jason Holder',  
                                'Jason Holder':'Ravichandran Ashwin',  
                                'Zampa':'Adam Zampa',  
                                'Chahal':'Yuzvendra Chahal',  
                                'Boult':'Trent Boult',  
                                'Maxwell':'Glenn Maxwell',  
                                'Siraj':'Mohammed Siraj',  
                                'Parnell':'Wayne Parnell',  
                                'Willey':'David Willey',  
                                'W Hasaranga':'Wanindu Hasaranga',  
                                'Bhuvneshwar':'Bhuvneshwar Kumar',  
                                'Markram (c)':'Aiden Markram (c)',  
                                'Bhuvneshwar (c)':'Bhuvneshwar Kumar',  
                                'Markande':'Mayank Markande'  
                                },inplace=True)
```

```
In [151]: New_Team_Bowlers = B_data[["Team Bowling", "Bowler Name"]]  
New_Team_Bowlers.groupby(by = ["Team Bowling", "Bowler Name"]).count()
```

Out[151]:

| Team Bowling                | Bowler Name            |
|-----------------------------|------------------------|
| Chennai Super Kings Innings | Akash Singh            |
|                             | Ben Stokes             |
|                             | Deepak Chahar          |
|                             | Magala                 |
|                             | Maheesh Theekshana     |
|                             | Matheesha Pathirana    |
|                             | Mitchell Santner       |
|                             | Moeen Ali              |
|                             | Pretorius              |
|                             | Rajvardhan Hangargekar |
|                             | Ravindra Jadeja        |

## Top Wickets

```
In [152]: # Top Wickets
W_data = B_data[["Bowler Name", "Wickets"]].groupby(by = ["Bowler Name"]).sum().reset_index()
W_data
```

Out[152]:

|    | Bowler Name       | Wickets |
|----|-------------------|---------|
| 0  | Abhishek Sharma   | 2       |
| 1  | Adam Zampa        | 6       |
| 2  | Adil Rashid       | 2       |
| 3  | Aiden Markram (c) | 0       |
| 4  | Akash Deep        | 1       |
| 5  | Akash Madhwal     | 14      |
| 6  | Akash Singh       | 5       |
| 7  | Akeal Hosein      | 1       |
| 8  | Alzarri Joseph    | 7       |
| 9  | Amit Mishra       | 7       |
| 10 | Andre Russell     | 3       |

```
In [153]: Top_Wickets = W_data.sort_values("Wickets",ascending = False).head(10)
Top_Wickets
```

Out[153]:

|     | Bowler Name        | Wickets |
|-----|--------------------|---------|
| 102 | Rashid Khan (c)    | 25      |
| 82  | Mohit Sharma       | 21      |
| 138 | Yuzvendra Chahal   | 21      |
| 79  | Mohammed Shami     | 19      |
| 127 | Varun Chakaravathy | 18      |
| 123 | Tushar Deshpande   | 18      |
| 105 | Ravindra Jadeja    | 17      |
| 94  | Piyush Chawla      | 17      |
| 80  | Mohammed Siraj     | 16      |
| 103 | Ravi Bishnoi       | 16      |

## Top Over

```
In [154]: # Top Over
Over = B_data[["Bowler Name", "Overs"]].groupby(by=["Bowler Name"]).sum().reset_index()
Over
```

Out[154]:

|    | Bowler Name       | Overs |
|----|-------------------|-------|
| 0  | Abhishek Sharma   | 11    |
| 1  | Adam Zampa        | 18    |
| 2  | Adil Rashid       | 7     |
| 3  | Aiden Markram (c) | 4     |
| 4  | Akash Deep        | 5     |
| 5  | Akash Madhwal     | 23    |
| 6  | Akash Singh       | 16    |
| 7  | Akeal Hosein      | 4     |
| 8  | Alzarri Joseph    | 24    |
| 9  | Amit Mishra       | 17    |
| 10 | Andre Russell     | 12    |

```
In [155]: Overs_1 = Over.sort_values("Overs",ascending = False).head(10)
Overs_1
```

Out[155]:

|     | Bowler Name         | Overs |
|-----|---------------------|-------|
| 102 | Rashid Khan (c)     | 55    |
| 79  | Mohammed Shami      | 53    |
| 123 | Tushar Deshpande    | 51    |
| 94  | Piyush Chawla       | 50    |
| 105 | Ravindra Jadeja     | 50    |
| 103 | Ravi Bishnoi        | 46    |
| 138 | Yuzvendra Chahal    | 44    |
| 127 | Varun Chakaravarthy | 44    |
| 57  | Kuldeep Yadav       | 43    |
| 15  | Arshdeep Singh      | 42    |

## Wides



```
In [156]: Wides = B_data[["Bowler Name", "Wides"]].groupby(by = ["Bowler Name"]).sum().reset_index()  
Wides
```

Out[156]:

|    | Bowler Name       | Wides |
|----|-------------------|-------|
| 0  | Abhishek Sharma   | 2     |
| 1  | Adam Zampa        | 2     |
| 2  | Adil Rashid       | 0     |
| 3  | Aiden Markram (c) | 0     |
| 4  | Akash Deep        | 1     |
| 5  | Akash Madhwal     | 2     |
| 6  | Akash Singh       | 2     |
| 7  | Akeal Hosein      | 0     |
| 8  | Alzarri Joseph    | 6     |
| 9  | Amit Mishra       | 1     |
| 10 | Andre Russell     | 3     |

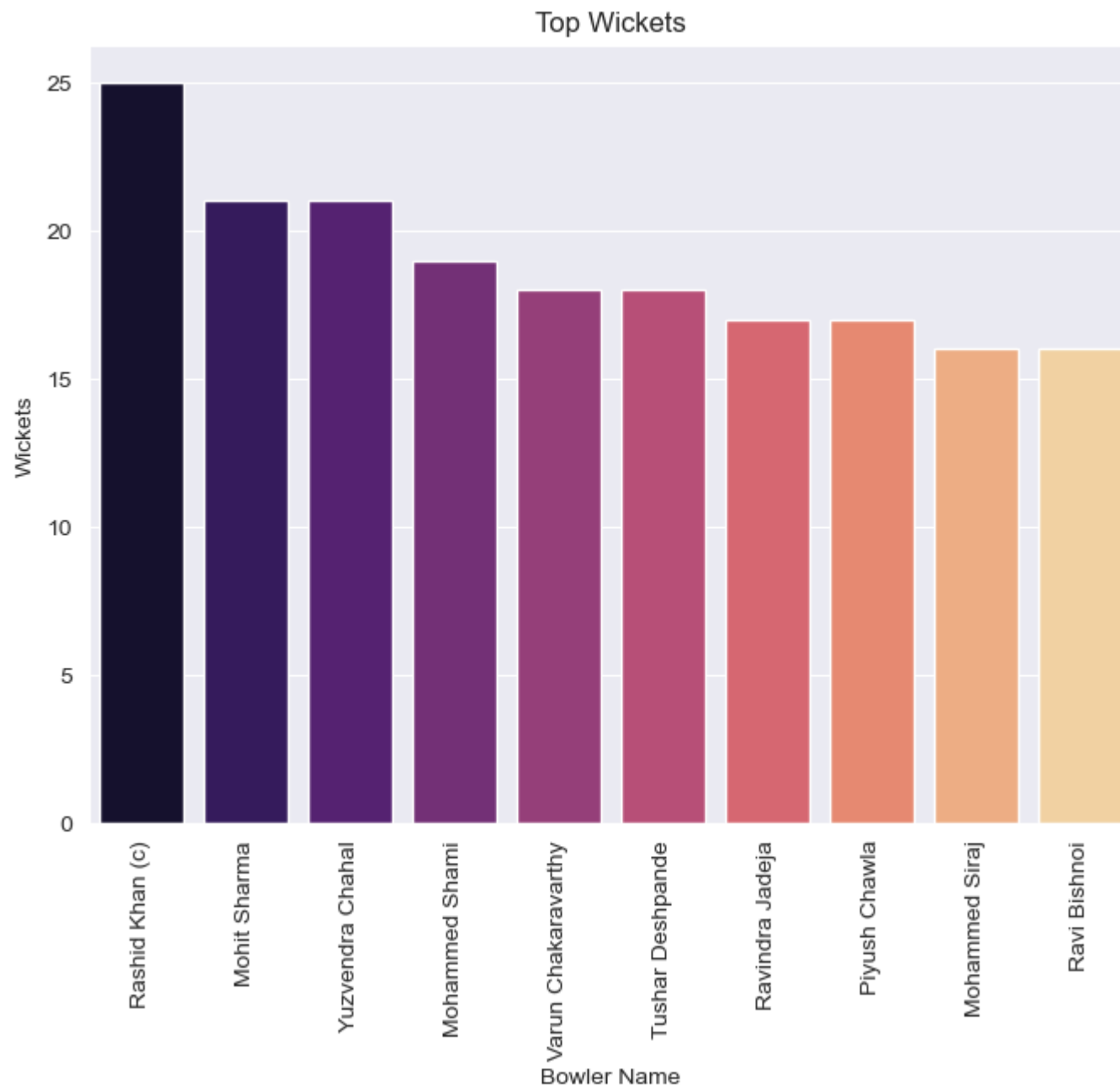
```
In [157]: Most_Wides = Wides.sort_values("Wides",ascending = False).head(10)
Most_Wides
```

Out[157]:

|     | Bowler Name         | Wides |
|-----|---------------------|-------|
| 72  | Matheesha Pathirana | 34    |
| 80  | Mohammed Siraj      | 28    |
| 123 | Tushar Deshpande    | 21    |
| 23  | Cameron Green       | 16    |
| 79  | Mohammed Shami      | 16    |
| 104 | Ravichandran Ashwin | 16    |
| 22  | Bhuvneshwar Kumar   | 15    |
| 15  | Arshdeep Singh      | 15    |
| 53  | Khaleel Ahmed       | 14    |
| 135 | Yash Thakur         | 14    |

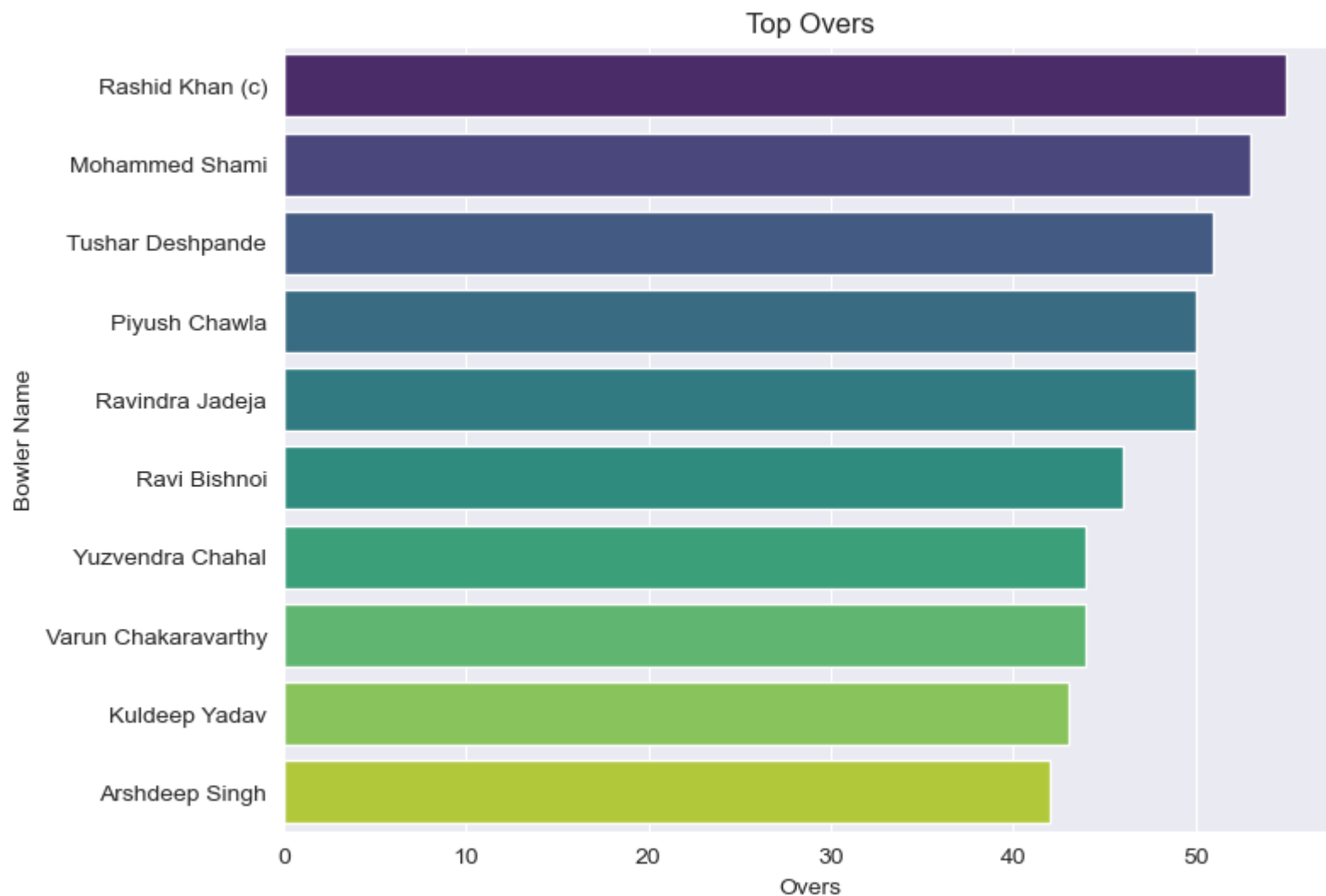
## graphical representation

```
In [158]: #Top Wickets
#x = Top_Wickets['Bowler Name']
#y = Top_Wickets['Wickets']
plt.figure(figsize = (8,6))
ax = sns.barplot(x = Top_Wickets['Bowler Name'],y = Top_Wickets['Wickets'],data = Top_Wickets,palette = "magma")
ax.set_xticklabels(ax.get_xticklabels(),rotation = 90)
plt.title("Top Wickets")
plt.show()
```



```
In [159]: #Top Over
#x = Overs_1['Overs']
#y = Overs_1['Bowler Name']

plt.figure(figsize = (8,6))
sns.barplot(x = Overs_1['Overs'],y = Overs_1['Bowler Name'],data = Overs_1,palette = "viridis",errorbar=('ci'
plt.title("Top Overs")
plt.show()
```

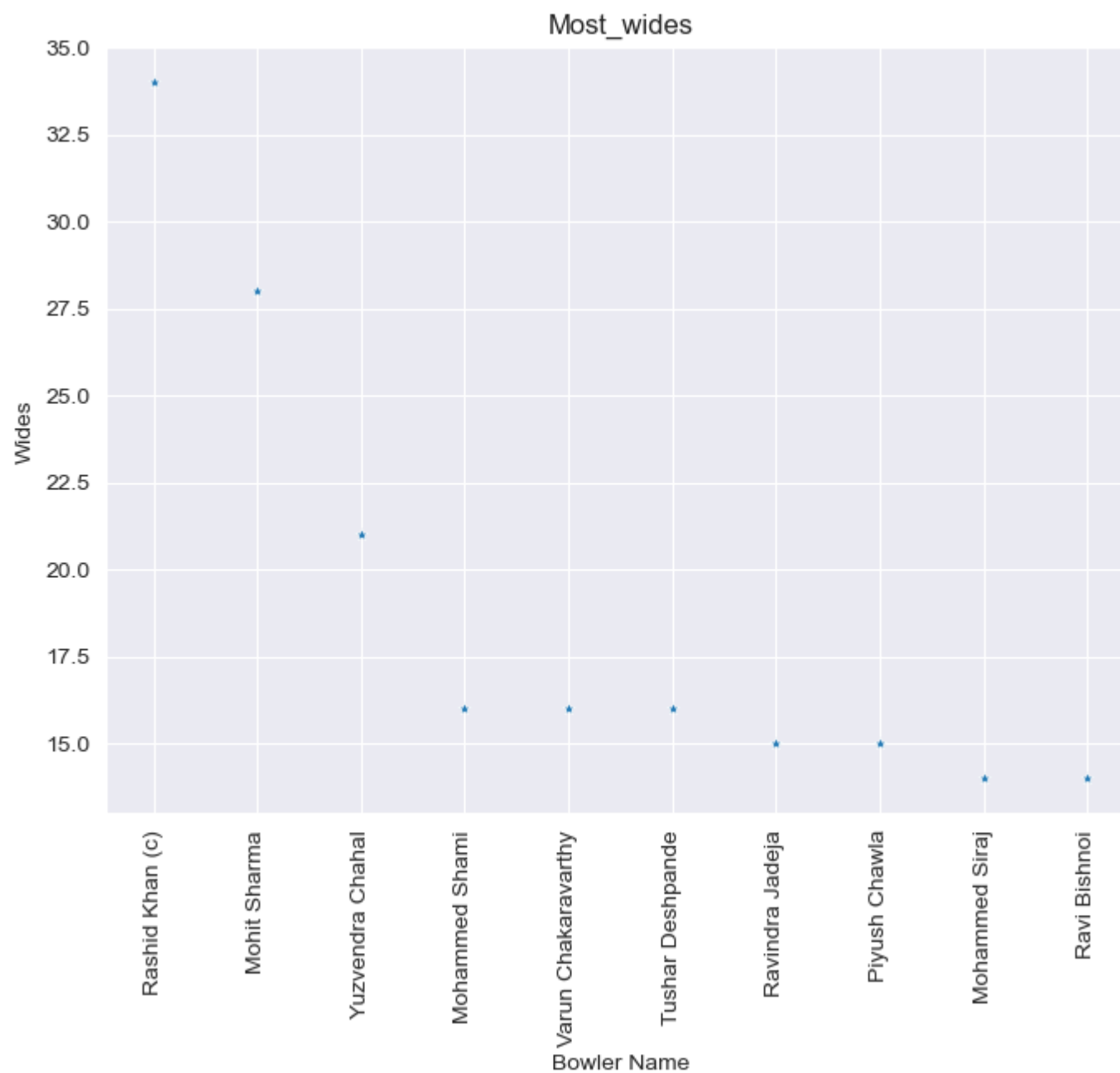


```
In [160]: #Most_wides
#x = Most_Wides['Bowler Name']
#y = Most_Wides['Wides']
plt.figure(figsize = (8,6))

ay = sns.scatterplot(x = Most_Wides['Bowler Name'],y = Most_Wides['Wides'],data = Most_Wides,marker = "*")
ay.set_xticklabels(ax.get_xticklabels(),rotation = 90)
plt.title("Most_wides")
plt.show()
```

C:\Users\Vasu Prasad\AppData\Local\Temp\ipykernel\_8488\3955265520.py:7: UserWarning: FixedFormatter should only be used together with FixedLocator

```
    ay.set_xticklabels(ax.get_xticklabels(),rotation = 90)
```



## match data

```
In [161]: Match_data = pd.read_csv("file:///C:/Users/Vasu%20Prasad/OneDrive/Documents/MCA/IPL_Project/Dataset/2023/match_data")
Match_data
```

Out[161]:

|   | Unnamed: 0 | Date        | Time    | Teams   | Winners                                   |
|---|------------|-------------|---------|---|---|
| 0 | 0          | Mar 31, Fri | 7:30 PM | GUJARAT TITANS vs CHENNAI SUPER KINGS, 1st Match  | Gujarat Titans won by 5 wkts              |
| 1 | 1          | Apr 01, Sat | 3:30 PM | PUNJAB KINGS vs KOLKATA KNIGHT RIDERS, 2nd Match  | Punjab Kings won by 7 runs (DLS method)   |
| 2 | 2          | NaN         | 7:30 PM | LUCKNOW SUPER GIANTS vs DELHI CAPITALS, 3rd Match | Lucknow Super Giants won by 50 runs       |
| 3 | 3          | Apr 02, Sun | 3:30 PM | SUNRISERS HYDERABAD vs RAJASTHAN ROYALS, 4th M... | Rajasthan Royals won by 72 runs           |
| 4 | 4          | NaN         | 7:30 PM | ROYAL CHALLENGERS BANGALORE vs MUMBAI INDIANS,... | Royal Challengers Bangalore won by 8 wkts |
| 5 | 5          | Apr 03, Mon | 7:30 PM | CHENNAI SUPER KINGS vs LUCKNOW SUPER GIANTS, 6... | Chennai Super Kings won by 12 runs        |
| 6 | 6          | Apr 04, Tue | 7:30 PM | DELHI CAPITALS vs GUJARAT TITANS, 7th Match       | Gujarat Titans won by 6 wkts              |

```
In [162]: Match_data.rename(columns = {'Unnamed: 0': 'Match_Id'}, inplace = True)
```



In [163]: Match\_data

Out[163]:

|   | Match_Id | Date        | Time    | Teams   | Winners                                   |
|---|----------|-------------|---------|---|---|
| 0 | 0        | Mar 31, Fri | 7:30 PM | GUJARAT TITANS vs CHENNAI SUPER KINGS, 1st Match  | Gujarat Titans won by 5 wkts              |
| 1 | 1        | Apr 01, Sat | 3:30 PM | PUNJAB KINGS vs KOLKATA KNIGHT RIDERS, 2nd Match  | Punjab Kings won by 7 runs (DLS method)   |
| 2 | 2        | NaN         | 7:30 PM | LUCKNOW SUPER GIANTS vs DELHI CAPITALS, 3rd Match | Lucknow Super Giants won by 50 runs       |
| 3 | 3        | Apr 02, Sun | 3:30 PM | SUNRISERS HYDERABAD vs RAJASTHAN ROYALS, 4th M... | Rajasthan Royals won by 72 runs           |
| 4 | 4        | NaN         | 7:30 PM | ROYAL CHALLENGERS BANGALORE vs MUMBAI INDIANS,... | Royal Challengers Bangalore won by 8 wkts |
| 5 | 5        | Apr 03, Mon | 7:30 PM | CHENNAI SUPER KINGS vs LUCKNOW SUPER GIANTS, 6... | Chennai Super Kings won by 12 runs        |
| 6 | 6        | Apr 04, Tue | 7:30 PM | DELHI CAPITALS vs GUJARAT TITANS, 7th Match       | Gujarat Titans won by 6 wkts              |
|   |          |             | 7:30 PM |   |   |