```python
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn
import os
import plotly.express as px
import plotly.graph_objects as go
from plotly.subplots import make_subplots

matches_df = pd.read_csv('C:/Users/Agilesh/Downloads/archive
(9)/matches.csv')

matches_df
```

	season	team1	team2	date
0	2024	Canada	United States of America	2024/06/01
1	2024	Papua New Guinea	West Indies	2024/06/02
2	2024	Oman	Namibia	2024/06/02
3	2024	Sri Lanka	South Africa	2024/06/03
4	2024	Afghanistan	Uganda	2024/06/03
5	2024	Scotland	England	2024/06/04
6	2024	Nepal	Netherlands	2024/06/04
7	2024	Ireland	India	2024/06/05
8	2024	Papua New Guinea	Uganda	2024/06/05
9	2024	Australia	Oman	2024/06/05
10	2024	Pakistan	United States of America	2024/06/06
11	2024	Namibia	Scotland	2024/06/06
12	2024	Canada	Ireland	2024/06/07
13	2024	Afghanistan	New Zealand	2024/06/07
14	2024	Sri Lanka	Bangladesh	2024/06/07
15	2024	Netherlands	South Africa	2024/06/08
16	2024	Australia	England	2024/06/08

17	2024 2024/06/08	West Indies	Uganda
18	2024 2024/06/09	India	Pakistan
19	2024 2024/06/09	Oman	Scotland
20	2024 2024/06/10	South Africa	Bangladesh
21	2024 2024/06/11	Canada	Pakistan
22	2024 2024/06/11	Namibia	Australia
23	2024 2024/06/12	United States of America	India
24	2024 2024/06/12	West Indies	New Zealand
25	2024 2024/06/13	Bangladesh	Netherlands
26	2024 2024/06/13	Oman	England
27	2024 2024/06/13	Papua New Guinea	Afghanistan
28	2024 2024/06/14	South Africa	Nepal
29	2024 2024/06/14	Uganda	New Zealand
30	2024 2024/06/15	England	Namibia
31	2024 2024/06/15	Scotland	Australia
32	2024 2024/06/16	Ireland	Pakistan
33	2024 2024/06/16	Bangladesh	Nepal
34	2024 2024/06/16	Sri Lanka	Netherlands
35	2024 2024/06/17	Papua New Guinea	New Zealand
36	2024 2024/06/17	West Indies	Afghanistan
37	2024 2024/06/19	South Africa	United States of America
38	2024 2024/06/19	West Indies	England
39	2024 2024/06/20	India	Afghanistan
40	2024 2024/06/20	Bangladesh	Australia
41	2024	South Africa	England

				2024/06/21
42	2024	United States of America	West Indies	2024/06/21
43	2024	India	Bangladesh	2024/06/22
44	2024	Afghanistan	Australia	2024/06/22
45	2024	United States of America	England	2024/06/23
46	2024	West Indies	South Africa	2024/06/23
47	2024	India	Australia	2024/06/24
48	2024	Afghanistan	Bangladesh	2024/06/24
49	2024	Afghanistan	South Africa	2024/06/26
50	2024	India	England	2024/06/27
51	2024	India	South Africa	2024/06/29

	match_number	venue \
0	1	Grand Prairie Stadium
1	2	Providence Stadium
2	3	Kensington Oval
3	4	Nassau County International Cricket Stadium
4	5	Providence Stadium
5	6	Kensington Oval
6	7	Grand Prairie Stadium
7	8	Nassau County International Cricket Stadium
8	9	Providence Stadium
9	10	Kensington Oval
10	11	Grand Prairie Stadium
11	12	Kensington Oval
12	13	Nassau County International Cricket Stadium
13	14	Providence Stadium
14	15	Grand Prairie Stadium
15	16	Nassau County International Cricket Stadium
16	17	Kensington Oval
17	18	Providence Stadium
18	19	Nassau County International Cricket Stadium
19	20	Sir Vivian Richards Stadium
20	21	Nassau County International Cricket Stadium
21	22	Nassau County International Cricket Stadium
22	24	Sir Vivian Richards Stadium
23	25	Nassau County International Cricket Stadium
24	26	Brian Lara Stadium
25	27	Arnos Vale Ground

```
26          28                                      Sir Vivian Richards Stadium
27          29                                           Brian Lara Stadium
28          31                                           Arnos Vale Ground
29          32                                           Brian Lara Stadium
30          34                                      Sir Vivian Richards Stadium
31          35                              Daren Sammy National Cricket Stadium
32          36       Central Broward Regional Park Stadium Turf Ground
33          37                                           Arnos Vale Ground
34          38                              Daren Sammy National Cricket Stadium
35          39                                           Brian Lara Stadium
36          40                              Daren Sammy National Cricket Stadium
37          41                                      Sir Vivian Richards Stadium
38          42                              Daren Sammy National Cricket Stadium
39          43                                             Kensington Oval
40          44                                      Sir Vivian Richards Stadium
41          45                              Daren Sammy National Cricket Stadium
42          46                                             Kensington Oval
43          47                                      Sir Vivian Richards Stadium
44          48                                           Arnos Vale Ground
45          49                                             Kensington Oval
46          50                                      Sir Vivian Richards Stadium
47          51                              Daren Sammy National Cricket Stadium
48          52                                           Arnos Vale Ground
49          53                                           Brian Lara Stadium
50          54                                           Providence Stadium
51          55                                             Kensington Oval

              city                 toss_winner toss_decision player_of_match  \
0           Dallas  United States of America          field           Aaron
Jones
1       Providence              West Indies          field              RL
Chase
2       Bridgetown                  Namibia          field               D
Wiese
3         New York                Sri Lanka            bat               A
Nortje
4       Providence                   Uganda          field        Fazalhaq
Farooqi
5       Bridgetown                 Scotland            bat
NaN
6           Dallas              Netherlands          field             TJG
Pringle
7         New York                    India          field              JJ
Bumrah
8       Providence                   Uganda          field          Riazat
Ali Shah
9       Bridgetown                     Oman          field              MP
Stoinis
```

10	Dallas	United States of America	field	MD Patel
11	Bridgetown	Namibia	bat	MA Leask
12	New York	Ireland	field	NR Kirton
13	Providence	New Zealand	field	Rahmanullah Gurbaz
14	Dallas	Bangladesh	field	Rishad Hossain
15	New York	South Africa	field	DA Miller
16	Bridgetown	England	field	A Zampa
17	Providence	West Indies	bat	AJ Hosein
18	New York	Pakistan	field	JJ Bumrah
19	North Sound	Oman	bat	BJ McMullen
20	New York	South Africa	bat	H Klaasen
21	New York	Pakistan	field	Mohammad Amir
22	North Sound	Australia	field	A Zampa
23	New York	India	field	Arshdeep Singh
24	Tarouba	New Zealand	field	SE Rutherford
25	Kingstown	Netherlands	field	Shakib Al Hasan
26	North Sound	England	field	AU Rashid
27	Tarouba	Afghanistan	field	Fazalhaq Farooqi
28	Kingstown	Nepal	field	T Shamsi
29	Tarouba	New Zealand	field	TG Southee
30	North Sound	Namibia	field	HC Brook
31	Gros Islet	Australia	field	MP Stoinis
32	Lauderhill	Pakistan	field	Shaheen Shah Afridi
33	Kingstown	Nepal	field	Tanzim Hasan Sakib
34	Gros Islet	Netherlands	field	KIC

```
Asalanka
35         Tarouba                New Zealand              field               LH
Ferguson
36     Gros Islet                 Afghanistan              field                N
Pooran
37   North Sound  United States of America                field                Q
de Kock
38     Gros Islet                     England              field
PD Salt
39     Bridgetown                       India                bat               SA
Yadav
40   North Sound                   Australia              field               PJ
Cummins
41     Gros Islet                     England              field                Q
de Kock
42     Bridgetown                 West Indies              field               RL
Chase
43   North Sound                  Bangladesh              field               HH
Pandya
44     Kingstown                   Australia              field
Gulbadin Naib
45     Bridgetown                     England              field               AU
Rashid
46   North Sound                South Africa              field                T
Shamsi
47     Gros Islet                   Australia              field               RG
Sharma
48     Kingstown                 Afghanistan                bat           Naveen-
ul-Haq
49         Tarouba                Afghanistan                bat                M
Jansen
50     Providence                     England              field               AR
Patel
51     Bridgetown                       India                bat                V
Kohli

               umpire1              umpire2      reserve_umpire
match_referee  \
0       RK Illingworth          Sharfuddoula           L Rusere  RB
Richardson
1          AT Holdstock           Rashid Riaz     HDPK Dharmasena       AJ
Pycroft
2        J Madanagopal             JS Wilson         Asif Yaqoob       RS
Madugalle
3            CM Brown      RA Kettleborough           AG Wharf       JJ
Crowe
4          Ahsan Raza       HDPK Dharmasena         Rashid Riaz       AJ
Pycroft
5          Asif Yaqoob           Nitin Menon     J Madanagopal       RS
```

Madugalle

6	L Rusere	RJ Tucker	RK Illingworth	RB Richardson
7	AG Wharf	CB Gaffaney	CM Brown	DC Boon
8	AT Holdstock	Rashid Riaz	HDPK Dharmasena	J Srinath
9	Asif Yaqoob	JS Wilson	Nitin Menon	RS Madugalle
10	A Paleker	MA Gough	RJ Tucker	JJ Crowe
11	J Madanagopal	Nitin Menon	JS Wilson	AJ Pycroft
12	RA Kettleborough	SJ Nogajski	CB Gaffaney	RB Richardson
13	Ahsan Raza	HDPK Dharmasena	AT Holdstock	J Srinath
14	MA Gough	PR Reiffel	RJ Tucker	JJ Crowe
15	CB Gaffaney	Sharfuddoula	SJ Nogajski	DC Boon
16	JS Wilson	Nitin Menon	J Madanagopal	AJ Pycroft
17	HDPK Dharmasena	Rashid Riaz	Ahsan Raza	J Srinath
18	RK Illingworth	RJ Tucker	Sharfuddoula	DC Boon
19	A Paleker	CM Brown	AG Wharf	RB Richardson
20	RK Illingworth	SJ Nogajski	PR Reiffel	RS Madugalle
21	AT Holdstock	HDPK Dharmasena	PR Reiffel	RS Madugalle
22	Nitin Menon	Rashid Riaz	A Paleker	J Srinath
23	PR Reiffel	SJ Nogajski	AT Holdstock	RS Madugalle
24	Ahsan Raza	AG Wharf	MA Gough	DC Boon
25	CM Brown	J Madanagopal	JS Wilson	RB Richardson
26	Asif Yaqoob	L Rusere	Rashid Riaz	AJ Pycroft
27	AG Wharf	MA Gough	Ahsan Raza	DC Boon
28	J Madanagopal	JS Wilson	SJ Nogajski	RB Richardson
29	PR Reiffel	RK Illingworth	Ahsan Raza	DC Boon

30	AT Holdstock	L Rusere	Nitin Menon	RS Madugalle
31	Asif Yaqoob	MA Gough	A Paleker	JJ Crowe
32	CB Gaffaney	RJ Tucker	RA Kettleborough	J Srinath
33	Ahsan Raza	SJ Nogajski	HDPK Dharmasena	RB Richardson
34	AG Wharf	A Paleker	Asif Yaqoob	JJ Crowe
35	L Rusere	PR Reiffel	RK Illingworth	DC Boon
36	A Paleker	CM Brown	MA Gough	JJ Crowe
37	CB Gaffaney	RA Kettleborough	L Rusere	RS Madugalle
38	Ahsan Raza	Nitin Menon	CM Brown	JJ Crowe
39	PR Reiffel	RJ Tucker	AG Wharf	DC Boon
40	MA Gough	RK Illingworth	AT Holdstock	RB Richardson
41	CM Brown	Sharfuddoula	CB Gaffaney	JJ Crowe
42	A Paleker	PR Reiffel	AG Wharf	DC Boon
43	AT Holdstock	MA Gough	RA Kettleborough	RS Madugalle
44	Ahsan Raza	HDPK Dharmasena	Nitin Menon	JJ Crowe
45	CB Gaffaney	JS Wilson	A Paleker	DC Boon
46	AG Wharf	RJ Tucker	Sharfuddoula	RS Madugalle
47	RK Illingworth	RA Kettleborough	HDPK Dharmasena	JJ Crowe
48	L Rusere	Nitin Menon	Ahsan Raza	RB Richardson
49	Nitin Menon	RK Illingworth	Ahsan Raza	RB Richardson
50	CB Gaffaney	RJ Tucker	PR Reiffel	JJ Crowe
51	CB Gaffaney	RK Illingworth	RJ Tucker	RB Richardson

	winner	winner_runs	winner_wickets	match_type
0	United States of America	NaN	7.0	Group
1	West Indies	NaN	5.0	Group

2	NaN	NaN	NaN	Group
3	South Africa	NaN	6.0	Group
4	Afghanistan	125.0	NaN	Group
5	No Result	NaN	NaN	Group
6	Netherlands	NaN	6.0	Group
7	India	NaN	8.0	Group
8	Uganda	NaN	3.0	Group
9	Australia	39.0	NaN	Group
10	NaN	NaN	NaN	Group
11	Scotland	NaN	5.0	Group
12	Canada	12.0	NaN	Group
13	Afghanistan	84.0	NaN	Group
14	Bangladesh	NaN	2.0	Group
15	South Africa	NaN	4.0	Group
16	Australia	36.0	NaN	Group
17	West Indies	134.0	NaN	Group
18	India	6.0	NaN	Group
19	Scotland	NaN	7.0	Group
20	South Africa	4.0	NaN	Group
21	Pakistan	NaN	7.0	Group
22	Australia	NaN	9.0	Group
23	India	NaN	7.0	Group
24	West Indies	13.0	NaN	Group
25	Bangladesh	25.0	NaN	Group
26	England	NaN	8.0	Group
27	Afghanistan	NaN	7.0	Group

28	South Africa	1.0	NaN	Group
29	New Zealand	NaN	9.0	Group
30	England	41.0	NaN	Group
31	Australia	NaN	5.0	Group
32	Pakistan	NaN	3.0	Group
33	Bangladesh	21.0	NaN	Group
34	Sri Lanka	83.0	NaN	Group
35	New Zealand	NaN	7.0	Group
36	West Indies	104.0	NaN	Group
37	South Africa	18.0	NaN	Group
38	England	NaN	8.0	Group
39	India	47.0	NaN	Group
40	Australia	28.0	NaN	Group
41	South Africa	7.0	NaN	Group
42	West Indies	NaN	9.0	Group
43	India	50.0	NaN	Group
44	Afghanistan	21.0	NaN	Group
45	England	NaN	10.0	Group
46	South Africa	NaN	3.0	Group
47	India	24.0	NaN	Group
48	Afghanistan	8.0	NaN	Group
49	South Africa	NaN	9.0	Semi Final
50	India	68.0	NaN	Semi Final
51	India	7.0	NaN	Final

```
delivery_df = pd.read_csv('C:/Users/Agilesh/Downloads/archive
(9)/deliveries.csv')
```

```
delivery_df

       match_id   season   start_date
venue  \
0             1    2024    2024-06-02           Providence Stadium,
Guyana
1             1    2024    2024-06-02           Providence Stadium,
Guyana
2             1    2024    2024-06-02           Providence Stadium,
Guyana
3             1    2024    2024-06-02           Providence Stadium,
Guyana
4             1    2024    2024-06-02           Providence Stadium,
Guyana
...         ...     ...           ...
...
11467        54    2024    2024-06-29  Kensington Oval, Bridgetown,
Barbados
11468        54    2024    2024-06-29  Kensington Oval, Bridgetown,
Barbados
11469        54    2024    2024-06-29  Kensington Oval, Bridgetown,
Barbados
11470        54    2024    2024-06-29  Kensington Oval, Bridgetown,
Barbados
11471        54    2024    2024-06-29  Kensington Oval, Bridgetown,
Barbados

        innings   ball       batting_team  bowling_team       striker
non_striker  \
0             1    0.1  Papua New Guinea   West Indies        TP Ura        A
Vala
1             1    0.2  Papua New Guinea   West Indies        TP Ura        A
Vala
2             1    0.3  Papua New Guinea   West Indies        A Vala
TP Ura
3             1    0.4  Papua New Guinea   West Indies        A Vala
TP Ura
4             1    0.5  Papua New Guinea   West Indies        A Vala
TP Ura
...         ...    ...                ...           ...           ...
...
11467         2   19.3       South Africa         India     K Rabada   KA
Maharaj
11468         2   19.4       South Africa         India   KA Maharaj      K
Rabada
11469         2   19.5       South Africa         India     K Rabada   KA
Maharaj
11470         2   19.6       South Africa         India     K Rabada   KA
Maharaj
11471         2   19.7       South Africa         India     A Nortje   KA
```

Maharaj

	...	extras	wides	noballs	byes	legbyes	penalty	wicket_type
0	...	0	NaN	NaN	NaN	NaN	NaN	NaN
1	...	0	NaN	NaN	NaN	NaN	NaN	NaN
2	...	0	NaN	NaN	NaN	NaN	NaN	NaN
3	...	0	NaN	NaN	NaN	NaN	NaN	NaN
4	...	0	NaN	NaN	NaN	NaN	NaN	NaN
...	...	...	...	...	...	...	...	...
11467	...	1	NaN	NaN	1.0	NaN	NaN	NaN
11468	...	1	NaN	NaN	NaN	1.0	NaN	NaN
11469	...	1	1.0	NaN	NaN	NaN	NaN	NaN
11470	...	0	NaN	NaN	NaN	NaN	NaN	caught
11471	...	0	NaN	NaN	NaN	NaN	NaN	NaN

	player_dismissed	other_wicket_type	other_player_dismissed
0	NaN	NaN	NaN
1	NaN	NaN	NaN
2	NaN	NaN	NaN
3	NaN	NaN	NaN
4	NaN	NaN	NaN
...	...	...	...
11467	NaN	NaN	NaN
11468	NaN	NaN	NaN
11469	NaN	NaN	NaN
11470	K Rabada	NaN	NaN
11471	NaN	NaN	NaN

[11472 rows x 22 columns]

```python
matches_df.shape , delivery_df.shape
```

((52, 18), (11472, 22))

```python
# finding the unique data points
matches_df.nunique()
```

season   1
team1   19

```
team2              17
date               26
match_number       52
venue               9
city                9
toss_winner        18
toss_decision       2
player_of_match    43
umpire1            16
umpire2            17
reserve_umpire     20
match_referee       6
winner             16
winner_runs        23
winner_wickets      9
match_type          3
dtype: int64
```

```python
#list of countries
t1 = set(matches_df['team1'].tolist())
t2 = set(matches_df['team2'].tolist())
team_list = t1|t2
team_list
```

```
{'Afghanistan',
 'Australia',
 'Bangladesh',
 'Canada',
 'England',
 'India',
 'Ireland',
 'Namibia',
 'Nepal',
 'Netherlands',
 'New Zealand',
 'Oman',
 'Pakistan',
 'Papua New Guinea',
 'Scotland',
 'South Africa',
 'Sri Lanka',
 'Uganda',
 'United States of America',
 'West Indies'}
```

```python
toss_winn = set(matches_df['toss_winner'].tolist())
team_list - toss_winn
```

```
{'Canada', 'Papua New Guinea'}
```

```
t1-t2, t2-t1

({'Canada', 'Papua New Guinea', 'Sri Lanka'}, {'New Zealand'})

delivery_df.nunique()

match_id                    52
season                       1
start_date                  26
venue                        9
innings                      4
ball                       165
batting_team                20
bowling_team                20
striker                    245
non_striker                234
bowler                     162
runs_off_bat                 7
extras                       6
wides                        4
noballs                      1
byes                         3
legbyes                      4
penalty                      1
wicket_type                  8
player_dismissed           227
other_wicket_type            0
other_player_dismissed       0
dtype: int64
```

```python
# check random rcords
matches_df.sample(5)
```

```
        season                      team1           team2          date
match_number  \
45        2024  United States of America         England    2024/06/23
49
24        2024               West Indies     New Zealand    2024/06/12
26
22        2024                   Namibia       Australia    2024/06/11
24
23        2024  United States of America           India    2024/06/12
25
14        2024                 Sri Lanka      Bangladesh    2024/06/07
15


                                       venue          city
toss_winner  \
45                            Kensington Oval    Bridgetown
England
```

```
24                               Brian Lara Stadium      Tarouba   New
Zealand
22                     Sir Vivian Richards Stadium   North Sound
Australia
23  Nassau County International Cricket Stadium      New York
India
14                           Grand Prairie Stadium       Dallas
Bangladesh

   toss_decision player_of_match       umpire1       umpire2
reserve_umpire  \
45         field      AU Rashid  CB Gaffaney    JS Wilson       A
Paleker
24         field   SE Rutherford   Ahsan Raza     AG Wharf      MA
Gough
22         field        A Zampa  Nitin Menon  Rashid Riaz       A
Paleker
23         field  Arshdeep Singh   PR Reiffel  SJ Nogajski     AT
Holdstock
14         field  Rishad Hossain     MA Gough   PR Reiffel      RJ
Tucker

   match_referee       winner  winner_runs  winner_wickets match_type

45      DC Boon       England          NaN            10.0      Group

24      DC Boon   West Indies         13.0             NaN      Group

22    J Srinath     Australia          NaN             9.0      Group

23  RS Madugalle         India          NaN             7.0      Group

14     JJ Crowe    Bangladesh          NaN             2.0      Group


delivery_df.sample(5)

      match_id  season  start_date  \
5034        23    2024  2024-06-11
4173        18    2024  2024-06-09
5675        26    2024  2024-06-13
9673        46    2024  2024-06-22
7542        37    2024  2024-06-16


                                             venue   innings  ball
\
5034  Sir Vivian Richards Stadium, North Sound, Antigua        1    6.1

4173  Nassau County International Cricket Stadium, N...        1   17.1

5675          Arnos Vale Ground, Kingstown, St Vincent        1    8.6
```

```
9673  Sir Vivian Richards Stadium, North Sound, Antigua      2   9.2

7542  Daren Sammy National Cricket Stadium, Gros Isl...      1  15.3


     batting_team bowling_team          striker
non_striker  ...  \
5034       Namibia    Australia         JJ Smit            MG
Erasmus  ...
4173         India     Pakistan       HH Pandya        Arshdeep
Singh  ...
5675   Bangladesh  Netherlands  Towhid Hridoy       Shakib Al
Hasan  ...
9673   Bangladesh        India   Tanzid Hasan  Nazmul Hossain
Shanto  ...
7542    Sri Lanka  Netherlands   KIC Asalanka              AD
Mathews  ...

      extras  wides  noballs  byes  legbyes  penalty  wicket_type  \
5034       0    NaN      NaN   NaN      NaN      NaN          NaN
4173       0    NaN      NaN   NaN      NaN      NaN          NaN
5675       0    NaN      NaN   NaN      NaN      NaN          NaN
9673       0    NaN      NaN   NaN      NaN      NaN          NaN
7542       0    NaN      NaN   NaN      NaN      NaN          NaN

      player_dismissed other_wicket_type other_player_dismissed
5034               NaN               NaN                    NaN
4173               NaN               NaN                    NaN
5675               NaN               NaN                    NaN
9673               NaN               NaN                    NaN
7542               NaN               NaN                    NaN

[5 rows x 22 columns]
```

```python
# data quality checks
matches_df['match_number'].unique()
```

```
array([ 1,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16, 17,
       18, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 31, 32, 34, 35, 36, 37,
       38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54,
       55], dtype=int64)
```

```python
delivery_df['match_id'].unique()
```

```
array([ 1,  0,  2,  3,  4,  5,  6,  7,  8,  9, 10, 11, 12, 13, 14, 15, 16,
       17, 18, 19, 20, 21, 23, 24, 25, 26, 27, 28, 30, 31, 33, 34, 35,
```

```
36,
       37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52,
53,
       54], dtype=int64)
```

delivery_df.isnull().sum()

```
match_id                     0
season                       0
start_date                   0
venue                        0
innings                      0
ball                         0
batting_team                 0
bowling_team                 0
striker                      0
non_striker                  0
bowler                       0
runs_off_bat                 0
extras                       0
wides                    11064
noballs                  11427
byes                     11431
legbyes                  11293
penalty                  11471
wicket_type              10788
player_dismissed         10788
other_wicket_type        11472
other_player_dismissed   11472
dtype: int64
```

matches_df.isnull().sum()

```
season             0
team1              0
team2              0
date               0
match_number       0
venue              0
city               0
toss_winner        0
toss_decision      0
player_of_match    1
umpire1            0
umpire2            0
reserve_umpire     0
match_referee      0
winner             2
winner_runs       27
winner_wickets    28
```

```
match_type            0
dtype: int64

matches_df[matches_df['winner'].isna()]

    season     team1                        team2          date
match_number  \
2     2024       Oman                      Namibia   2024/06/02
3
10    2024   Pakistan  United States of America   2024/06/06
11

                    venue        city              toss_winner
toss_decision  \
2          Kensington Oval   Bridgetown                  Namibia
field
10  Grand Prairie Stadium       Dallas  United States of America
field

    player_of_match        umpire1     umpire2 reserve_umpire
match_referee  \
2           D Wiese  J Madanagopal   JS Wilson    Asif Yaqoob   RS
Madugalle
10          MD Patel      A Paleker   MA Gough      RJ Tucker      JJ
Crowe

    winner  winner_runs  winner_wickets match_type
2     NaN          NaN             NaN      Group
10    NaN          NaN             NaN      Group

delivery_df[(delivery_df['batting_team'] == 'Oman') &
(delivery_df['bowling_team'] == 'Namibia')]

     match_id  season  start_date
venue  \
482          2    2024  2024-06-02  Kensington Oval, Bridgetown,
Barbados
483          2    2024  2024-06-02  Kensington Oval, Bridgetown,
Barbados
484          2    2024  2024-06-02  Kensington Oval, Bridgetown,
Barbados
485          2    2024  2024-06-02  Kensington Oval, Bridgetown,
Barbados
486          2    2024  2024-06-02  Kensington Oval, Bridgetown,
Barbados
..         ...     ...          ...                                 .
..
732          2    2024  2024-06-02  Kensington Oval, Bridgetown,
Barbados
733          2    2024  2024-06-02  Kensington Oval, Bridgetown,
```

```
Barbados
734          2     2024   2024-06-02   Kensington Oval, Bridgetown,
Barbados
735          2     2024   2024-06-02   Kensington Oval, Bridgetown,
Barbados
736          2     2024   2024-06-02   Kensington Oval, Bridgetown,
Barbados

      innings   ball  batting_team  bowling_team           striker  \
482        1    0.1           Oman       Namibia      KH Prajapati
483        1    0.2           Oman       Namibia        Aqib Ilyas
484        1    0.3           Oman       Namibia   Zeeshan Maqsood
485        1    0.4           Oman       Namibia   Zeeshan Maqsood
486        1    0.5           Oman       Namibia   Zeeshan Maqsood
..       ...    ...            ...           ...               ...
732        4    0.2           Oman       Namibia     Naseem Khushi
733        4    0.3           Oman       Namibia     Naseem Khushi
734        4    0.4           Oman       Namibia        Aqib Ilyas
735        4    0.5           Oman       Namibia   Zeeshan Maqsood
736        4    0.6           Oman       Namibia        Aqib Ilyas

         non_striker  ... extras  wides  noballs  byes  legbyes
penalty  \
482    Naseem Khushi  ...      0    NaN      NaN   NaN      NaN
NaN
483    Naseem Khushi  ...      0    NaN      NaN   NaN      NaN
NaN
484    Naseem Khushi  ...      0    NaN      NaN   NaN      NaN
NaN
485    Naseem Khushi  ...      0    NaN      NaN   NaN      NaN
NaN
486    Naseem Khushi  ...      0    NaN      NaN   NaN      NaN
NaN
..               ... ...    ...    ...      ...   ...      ...         .
..
732  Zeeshan Maqsood  ...      0    NaN      NaN   NaN      NaN
NaN
733  Zeeshan Maqsood  ...      0    NaN      NaN   NaN      NaN
NaN
734  Zeeshan Maqsood  ...      0    NaN      NaN   NaN      NaN
NaN
735       Aqib Ilyas  ...      0    NaN      NaN   NaN      NaN
NaN
736  Zeeshan Maqsood  ...      0    NaN      NaN   NaN      NaN
NaN

     wicket_type  player_dismissed other_wicket_type
other_player_dismissed
482          lbw      KH Prajapati               NaN
NaN
```

```
483            lbw         Aqib Ilyas                    NaN
NaN
484            NaN            NaN                        NaN
NaN
485            NaN            NaN                        NaN
NaN
486            NaN            NaN                        NaN
NaN
..             ...            ...                        ...
...
732            NaN            NaN                        NaN
NaN
733          bowled     Naseem Khushi                    NaN
NaN
734            NaN            NaN                        NaN
NaN
735            NaN            NaN                        NaN
NaN
736            NaN            NaN                        NaN
NaN

[127 rows x 22 columns]
```

```python
# get sum of runs scored by teams in innings 3
print(delivery_df[delivery_df['innings'] ==
3].groupby('batting_team')[['runs_off_bat', 'extras']].sum())
print(delivery_df[delivery_df['innings'] ==
4].groupby('batting_team')[['runs_off_bat', 'extras']].sum())
```

```
                          runs_off_bat  extras
batting_team
Namibia                             21       0
United States of America            11       7
              runs_off_bat  extras
batting_team
Oman                    10       0
Pakistan                 7       6
```

```python
matches_df.loc[2,'winner'] ='Namibia'
matches_df.loc[10,'winner'] ='United States of America'

matches_df[matches_df['winner'].isna()]
```

```
Empty DataFrame
Columns: [season, team1, team2, date, match_number, venue, city,
toss_winner, toss_decision, player_of_match, umpire1, umpire2,
reserve_umpire, match_referee, winner, winner_runs, winner_wickets,
match_type]
Index: []
```

```python
matches_df.describe()
```

```
          season   match_number   winner_runs   winner_wickets
count      52.0      52.000000     25.000000        24.000000
mean     2024.0      27.961538     40.240000         6.416667
std         0.0      16.453096     38.411457         2.244155
min      2024.0       1.000000      1.000000         2.000000
25%      2024.0      13.750000     12.000000         5.000000
50%      2024.0      27.500000     25.000000         7.000000
75%      2024.0      42.250000     50.000000         8.000000
max      2024.0      55.000000    134.000000        10.000000
```

delivery_df.describe()

```
           match_id       season       innings           ball   runs_off_bat
\
count   11472.000000    11472.0   11472.000000   11472.000000   11472.000000

mean       26.879794     2024.0       1.465394       9.108439       1.062413

std        16.343629        0.0       0.508687       5.612894       1.566343

min         0.000000     2024.0       1.000000       0.100000       0.000000

25%        12.000000     2024.0       1.000000       4.300000       0.000000

50%        26.000000     2024.0       1.000000       8.700000       1.000000

75%        42.000000     2024.0       2.000000      13.600000       1.000000

max        54.000000     2024.0       4.000000      19.800000       6.000000


               extras         wides      noballs          byes        legbyes
penalty  \
count   11472.000000    408.000000         45.0     41.000000     179.000000
1.0
mean        0.076360      1.245098          1.0      2.073171       1.301676
5.0
std         0.375929      0.857816          0.0      1.311302       0.866705
NaN
min         0.000000      1.000000          1.0      1.000000       1.000000
5.0
25%         0.000000      1.000000          1.0      1.000000       1.000000
5.0
50%         0.000000      1.000000          1.0      1.000000       1.000000
5.0
75%         0.000000      1.000000          1.0      4.000000       1.000000
5.0
max         5.000000      5.000000          1.0      4.000000       5.000000
5.0


         other_wicket_type   other_player_dismissed
```

```
count              0.0                0.0
mean               NaN                NaN
std                NaN                NaN
min                NaN                NaN
25%                NaN                NaN
50%                NaN                NaN
75%                NaN                NaN
max                NaN                NaN
```

visualize the available data

```python
fig = px.bar(matches_df.groupby('match_type').count().reset_index(),
x="match_type", y="team1")
fig.show()
```

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```
fig = px.bar(matches_df.groupby('match_type').count().reset_index(),
x="match_type", y="team2")
fig.show()
```

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# most wins by teams
fig = px.bar(
    matches_df.groupby('winner')
['match_number'].count().reset_index(),
    x="winner",
    y="match_number"

)

fig.update_layout(
    xaxis_title='Teams',
    yaxis_title='Matches won',
    xaxis=dict(tickangle=90)

)

fig.show()
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```python
tmp_df=matches_df.copy()
tmp_df['toss_win'] = np.where(tmp_df['winner'] ==
tmp_df['toss_winner'], tmp_df['toss_winner'], 'Other')

fig = px.bar(
    tmp_df.groupby(['winner', 'toss_win'])
['match_number'].count().reset_index(),
    x="winner",
    y="match_number",
    color = "toss_win"

)

fig.update_layout(
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)

fig.show()
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```python
# most runs scored & wickets by team
delivery_df['sum_runs'] = delivery_df['runs_off_bat'] +
delivery_df['extras']

fig = px.bar(
    delivery_df.groupby('batting_team')
['sum_runs'].sum().reset_index(),

    y='sum_runs',
    x='batting_team',
    text_auto=' .2s',
    title="Overall runs scored by teams"

)


fig.show()
```

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```
delivery_df['wicket_count'] =
np.where(delivery_df['wicket_type'].notnull(), 1,0)
```

```
fig = px.bar(delivery_df.groupby('bowling_team')
['wicket_count'].sum().reset_index(), y = 'wicket_count',
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            title="Overall wickets taken by teams")
fig.show()
```

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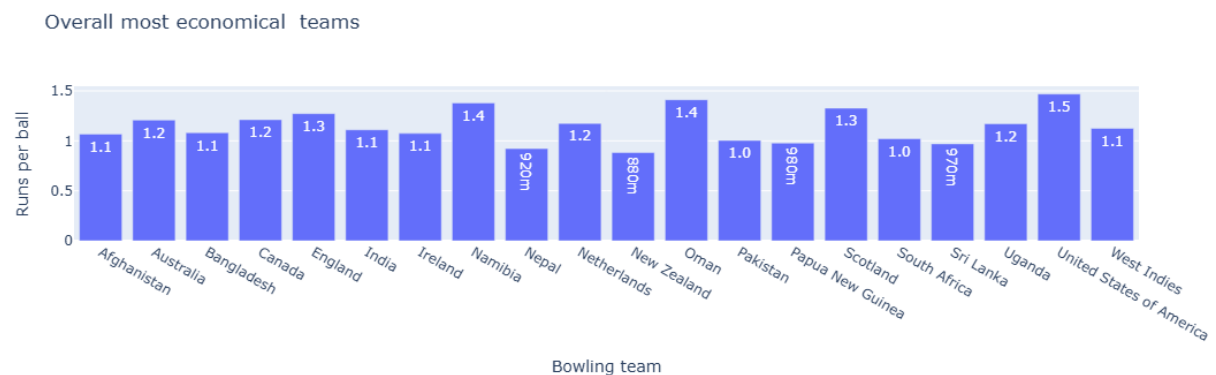{"text":"Overall wickets taken by teams"},"xaxis":
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[0,73.6842105263158],"title":
{"text":"wicket_count"},"type":"linear"}}}
```

```python
fig = px.bar(delivery_df.groupby('bowling_team')
['sum_runs'].mean().reset_index(), y = 'sum_runs', x='bowling_team',
text_auto='.2s',
            title="Overall most economical  teams")
fig.update_layout(
    xaxis_title='Bowling team',
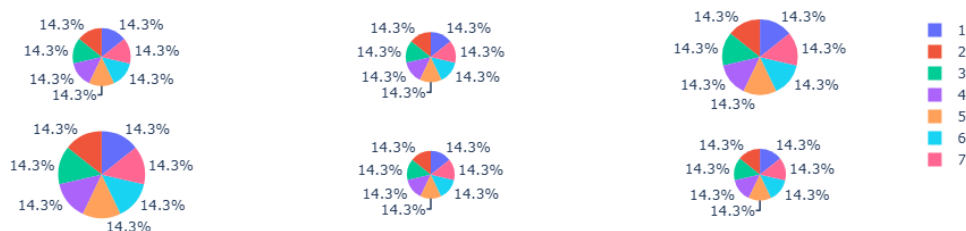    yaxis_title='Runs per ball',


)
fig.show()
```

Overall most economical teams


```python
# percentage distribution of runs by team
specs = [[{'type':'domain'} for x  in range (3)] for y in range(2)]
fig = make_subplots(rows=2, cols=3, specs=specs)
labels = [1,2,3,4,5,6,7]

t_list = list(team_list)
idx = 0
for i in range(1,3):
    for j in range(1,4):
        values = [sum(delivery_df[(delivery_df['batting_team'] ==
t_list[idx]) & (delivery_df['sum_runs'] == 1)]['sum_runs']) for i in
labels]
        fig.add_trace(go.Pie(labels=labels, values=values,
scalegroup='one' , name=t_list[idx]), row=i , col=j)
        idx+=1
```

```
fig.show()
```



```python
# most runs by players for each team
fig = go.Figure()

for i in range(len(t_list)):
    bat_df = delivery_df[delivery_df['batting_team'] == t_list[i]]
    batter_list = set(bat_df['striker'].tolist())
    run_list=[]
    bowls_count = []
    sr_list =[]
    hover_text = []
    for batter in batter_list:
        batter_runs = bat_df[bat_df['striker'] == batter]
['runs_off_bat'].sum()
        bowls_played = bat_df[bat_df['striker'] == batter]
['runs_off_bat'].count()
        strike_rate =(batter_runs/bowls_played)*100
        run_list.append(batter_runs)
        bowls_count.append(bowls_played)
        sr_list.append(strike_rate)
        hover_text.append(('Player {0} <br>' + 'Runs {1}<br>' + 'SR
{2}').format(batter,batter_runs, strike_rate))
    fig.add_trace(go.Scatter(x=run_list,y=bowls_count,name=t_list[i],
text=hover_text, marker_size=run_list))
sizeref = 2.*1000/(100**2)
fig.update_traces(mode='markers', marker=dict(sizemode='area',
sizeref=sizeref, line_width=2))
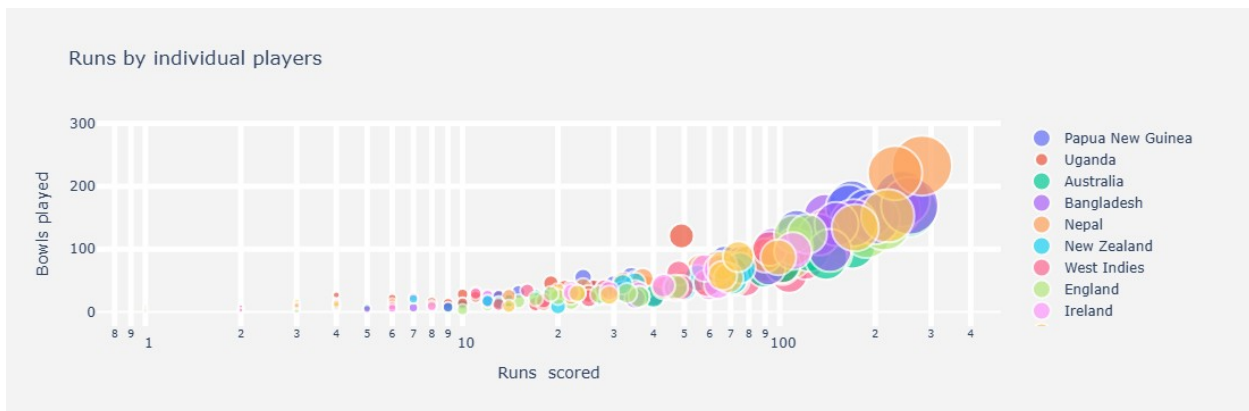
fig.update_layout(
    title='Runs by individual players',
    xaxis=dict(
        title='Runs  scored',
         gridcolor='white',
          type='log',
```

```
        gridwidth=5,
    ),
        yaxis=dict(
            title='Bowls played',
            gridcolor='white',
            gridwidth=5,
        ),
        paper_bgcolor='rgb(243, 243, 243)' ,
        plot_bgcolor ='rgb(243,243,243)' ,
)

fig.show()
```


Runs by individual players

```
fig = px.bar(
    matches_df.groupby('player_of_match')
['match_number'].count().reset_index(),
    x="player_of_match",
    y="match_number"

)
fig.show()
```