```
import numpy as np
import pandas as pd

match = pd.read_csv(r"C:\Users\Sambhav\Downloads\matches (1).csv")
delivery = pd.read_csv(r"C:\Users\Sambhav\Downloads\deliveries.csv")

match.head()
```

```
   id    Season       city        date                          team1  \
0   1  IPL-2017  Hyderabad  05-04-2017          Sunrisers Hyderabad
1   2  IPL-2017       Pune  06-04-2017               Mumbai Indians
2   3  IPL-2017     Rajkot  07-04-2017                Gujarat Lions
3   4  IPL-2017     Indore  08-04-2017       Rising Pune Supergiant
4   5  IPL-2017  Bangalore  08-04-2017  Royal Challengers Bangalore

                          team2                   toss_winner
toss_decision  \
0  Royal Challengers Bangalore  Royal Challengers Bangalore
field
1       Rising Pune Supergiant       Rising Pune Supergiant
field
2        Kolkata Knight Riders        Kolkata Knight Riders
field
3              Kings XI Punjab              Kings XI Punjab
field
4             Delhi Daredevils  Royal Challengers Bangalore
bat

   result  dl_applied                       winner  win_by_runs  \
0  normal           0          Sunrisers Hyderabad           35
1  normal           0       Rising Pune Supergiant            0
2  normal           0        Kolkata Knight Riders            0
3  normal           0              Kings XI Punjab            0
4  normal           0  Royal Challengers Bangalore           15

   win_by_wickets player_of_match
venue  \
0               0    Yuvraj Singh  Rajiv Gandhi International Stadium,
Uppal
1               7       SPD Smith    Maharashtra Cricket Association
Stadium
2              10         CA Lynn     Saurashtra Cricket Association
Stadium
3               6      GJ Maxwell                     Holkar Cricket
Stadium
4               0       KM Jadhav                      M Chinnaswamy
Stadium

          umpire1        umpire2 umpire3
0     AY Dandekar       NJ Llong     NaN
```

```
1  A Nand Kishore          S Ravi     NaN
2     Nitin Menon       CK Nandan     NaN
3    AK Chaudhary   C Shamshuddin     NaN
4             NaN             NaN     NaN
```

```
delivery.head()
```

```
   match_id  inning         batting_team                 bowling_team
over  \
0         1       1  Sunrisers Hyderabad  Royal Challengers Bangalore
1
1         1       1  Sunrisers Hyderabad  Royal Challengers Bangalore
1
2         1       1  Sunrisers Hyderabad  Royal Challengers Bangalore
1
3         1       1  Sunrisers Hyderabad  Royal Challengers Bangalore
1
4         1       1  Sunrisers Hyderabad  Royal Challengers Bangalore
1

   ball    batsman non_striker    bowler  is_super_over  ...  bye_runs
\
0     1  DA Warner    S Dhawan  TS Mills              0  ...         0

1     2  DA Warner    S Dhawan  TS Mills              0  ...         0

2     3  DA Warner    S Dhawan  TS Mills              0  ...         0

3     4  DA Warner    S Dhawan  TS Mills              0  ...         0

4     5  DA Warner    S Dhawan  TS Mills              0  ...         0


   legbye_runs  noball_runs  penalty_runs  batsman_runs  extra_runs  \
0            0            0             0             0           0
1            0            0             0             0           0
2            0            0             0             4           0
3            0            0             0             0           0
4            0            0             0             0           2

   total_runs  player_dismissed dismissal_kind fielder
0           0               NaN            NaN     NaN
1           0               NaN            NaN     NaN
2           4               NaN            NaN     NaN
3           0               NaN            NaN     NaN
4           2               NaN            NaN     NaN

[5 rows x 21 columns]
```

```
match.shape
```

```
(756, 18)
```

```
delivery.shape
```

```
(179078, 21)
```

```
total_score_df = delivery.groupby(['match_id','inning']).sum()
['total_runs'].reset_index()
total_score_df
```

```
      match_id  inning  total_runs
0            1       1         207
1            1       2         172
2            2       1         184
3            2       2         187
4            3       1         183
...        ...     ...         ...
1523     11413       2         170
1524     11414       1         155
1525     11414       2         162
1526     11415       1         152
1527     11415       2         157

[1528 rows x 3 columns]
```

```
total_score_df = total_score_df[total_score_df['inning'] == 1]
total_score_df
```

```
      match_id  inning  total_runs
0            1       1         207
2            2       1         184
4            3       1         183
6            4       1         163
8            5       1         157
...        ...     ...         ...
1518     11347       1         143
1520     11412       1         136
1522     11413       1         171
1524     11414       1         155
1526     11415       1         152

[756 rows x 3 columns]
```

```
match_df = match.merge(total_score_df[['match_id','total_runs']],
left_on='id', right_on='match_id')
match_df.head()
```

```
   id    Season       city        date                        team1  \
0   1  IPL-2017  Hyderabad  05-04-2017         Sunrisers Hyderabad
1   2  IPL-2017       Pune  06-04-2017              Mumbai Indians
2   3  IPL-2017     Rajkot  07-04-2017               Gujarat Lions
```

```
3   4  IPL-2017     Indore  08-04-2017       Rising Pune Supergiant
4   5  IPL-2017  Bangalore  08-04-2017  Royal Challengers Bangalore

                          team2                   toss_winner
toss_decision  \
0  Royal Challengers Bangalore  Royal Challengers Bangalore
field
1       Rising Pune Supergiant       Rising Pune Supergiant
field
2        Kolkata Knight Riders        Kolkata Knight Riders
field
3              Kings XI Punjab              Kings XI Punjab
field
4             Delhi Daredevils  Royal Challengers Bangalore
bat

   result  dl_applied                       winner  win_by_runs  \
0  normal           0          Sunrisers Hyderabad           35
1  normal           0       Rising Pune Supergiant            0
2  normal           0        Kolkata Knight Riders            0
3  normal           0              Kings XI Punjab            0
4  normal           0  Royal Challengers Bangalore           15

   win_by_wickets player_of_match
venue  \
0               0    Yuvraj Singh  Rajiv Gandhi International Stadium,
Uppal
1               7       SPD Smith    Maharashtra Cricket Association
Stadium
2              10         CA Lynn     Saurashtra Cricket Association
Stadium
3               6      GJ Maxwell                     Holkar Cricket
Stadium
4               0       KM Jadhav                      M Chinnaswamy
Stadium

          umpire1        umpire2 umpire3  match_id  total_runs
0     AY Dandekar       NJ Llong     NaN         1         207
1  A Nand Kishore         S Ravi     NaN         2         184
2     Nitin Menon      CK Nandan     NaN         3         183
3    AK Chaudhary  C Shamshuddin     NaN         4         163
4             NaN            NaN     NaN         5         157

match_df['team1'].unique()

array(['Sunrisers Hyderabad', 'Mumbai Indians', 'Gujarat Lions',
       'Rising Pune Supergiant', 'Royal Challengers Bangalore',
       'Kolkata Knight Riders', 'Delhi Daredevils', 'Kings XI Punjab',
       'Chennai Super Kings', 'Rajasthan Royals', 'Deccan Chargers',
       'Kochi Tuskers Kerala', 'Pune Warriors', 'Rising Pune
```

```
Supergiants',
       'Delhi Capitals'], dtype=object)
```

```
teams = [
    'Sunrisers Hyderabad',
    'Mumbai Indians',
    'Royal Challengers Bangalore',
    'Kolkata Knight Riders',
    'Kings XI Punjab',
    'Chennai Super Kings',
    'Rajasthan Royals',
    'Delhi Capitals'
]

match_df['team1'] = match_df['team1'].str.replace('Delhi
Daredevils','Delhi Capitals')
match_df['team2'] = match_df['team2'].str.replace('Delhi
Daredevils','Delhi Capitals')

match_df['team1'] = match_df['team1'].str.replace('Deccan Chargers',
'Sunrisers Hyderabad')
match_df['team2'] = match_df['team2'].str.replace('Deccan Chargers',
'Sunrisers Hyderabad')

match_df = match_df[match_df['team1'].isin(teams)]
match_df = match_df[match_df['team2'].isin(teams)]

match_df.shape
```

```
(641, 20)
```

```
match_df.head()
```

```
   id    Season       city        date                          team1  \
0   1  IPL-2017  Hyderabad  05-04-2017          Sunrisers Hyderabad
4   5  IPL-2017  Bangalore  08-04-2017  Royal Challengers Bangalore
6   7  IPL-2017     Mumbai  09-04-2017        Kolkata Knight Riders
7   8  IPL-2017     Indore  10-04-2017  Royal Challengers Bangalore
9  10  IPL-2017     Mumbai  12-04-2017          Sunrisers Hyderabad

                          team2                   toss_winner
toss_decision  \
0  Royal Challengers Bangalore  Royal Challengers Bangalore
field
4               Delhi Capitals  Royal Challengers Bangalore
bat
6               Mumbai Indians               Mumbai Indians
field
7              Kings XI Punjab  Royal Challengers Bangalore
bat
9               Mumbai Indians               Mumbai Indians
```

```
field

   result  dl_applied                       winner  win_by_runs  \
0  normal           0          Sunrisers Hyderabad           35
4  normal           0  Royal Challengers Bangalore           15
6  normal           0               Mumbai Indians            0
7  normal           0              Kings XI Punjab            0
9  normal           0               Mumbai Indians            0

   win_by_wickets player_of_match
venue  \
0               0    Yuvraj Singh  Rajiv Gandhi International Stadium,
Uppal
4               0       KM Jadhav                      M Chinnaswamy
Stadium
6               4          N Rana                          Wankhede
Stadium
7               8        AR Patel                     Holkar Cricket
Stadium
9               4       JJ Bumrah                          Wankhede
Stadium

        umpire1        umpire2 umpire3  match_id  total_runs
0   AY Dandekar       NJ Llong     NaN         1         207
4           NaN            NaN     NaN         5         157
6   Nitin Menon      CK Nandan     NaN         7         178
7  AK Chaudhary  C Shamshuddin     NaN         8         148
9   Nitin Menon      CK Nandan     NaN        10         158

match_df['dl_applied'].value_counts()

dl_applied
0    626
1     15
Name: count, dtype: int64

match_df = match_df[match_df['dl_applied'] == 0]
match_df

        id    Season           city        date
team1  \
0        1  IPL-2017      Hyderabad  05-04-2017          Sunrisers
Hyderabad
4        5  IPL-2017      Bangalore  08-04-2017  Royal Challengers
Bangalore
6        7  IPL-2017         Mumbai  09-04-2017        Kolkata Knight
Riders
7        8  IPL-2017         Indore  10-04-2017  Royal Challengers
Bangalore
9       10  IPL-2017         Mumbai  12-04-2017          Sunrisers
```

```
Hyderabad
..     ...       ...             ...          ...
...
751  11347  IPL-2019         Mumbai  05-05-2019        Kolkata Knight
Riders
752  11412  IPL-2019        Chennai  07-05-2019          Chennai Super
Kings
753  11413  IPL-2019  Visakhapatnam  08-05-2019          Sunrisers
Hyderabad
754  11414  IPL-2019  Visakhapatnam  10-05-2019               Delhi
Capitals
755  11415  IPL-2019      Hyderabad  12-05-2019               Mumbai
Indians

                            team2                   toss_winner
toss_decision  \
0    Royal Challengers Bangalore  Royal Challengers Bangalore
field
4                 Delhi Capitals  Royal Challengers Bangalore
bat
6                 Mumbai Indians               Mumbai Indians
field
7                Kings XI Punjab  Royal Challengers Bangalore
bat
9                 Mumbai Indians               Mumbai Indians
field
..                           ...                         ...
...
751               Mumbai Indians               Mumbai Indians
field
752               Mumbai Indians          Chennai Super Kings
bat
753               Delhi Capitals               Delhi Capitals
field
754          Chennai Super Kings          Chennai Super Kings
field
755          Chennai Super Kings               Mumbai Indians
bat

     result  dl_applied                       winner  win_by_runs  \
0    normal           0          Sunrisers Hyderabad           35
4    normal           0  Royal Challengers Bangalore           15
6    normal           0               Mumbai Indians            0
7    normal           0              Kings XI Punjab            0
9    normal           0               Mumbai Indians            0
..      ...         ...                          ...          ...
751  normal           0               Mumbai Indians            0
752  normal           0               Mumbai Indians            0
753  normal           0               Delhi Capitals            0
```

```
754  normal           0          Chennai Super Kings            0
755  normal           0               Mumbai Indians            1

     win_by_wickets player_of_match  \
0                 0    Yuvraj Singh
4                 0       KM Jadhav
6                 4          N Rana
7                 8        AR Patel
9                 4       JJ Bumrah
..              ...             ...
751               9       HH Pandya
752               6        AS Yadav
753               2         RR Pant
754               6    F du Plessis
755               0       JJ Bumrah

                                          venue        umpire1
umpire2  \
0    Rajiv Gandhi International Stadium, Uppal    AY Dandekar
NJ Llong
4                         M Chinnaswamy Stadium            NaN
NaN
6                              Wankhede Stadium    Nitin Menon       CK
Nandan
7                         Holkar Cricket Stadium   AK Chaudhary   C
Shamshuddin
9                              Wankhede Stadium    Nitin Menon       CK
Nandan
..                                         ...            ...
...
751                            Wankhede Stadium  Nanda Kishore        O
Nandan
752                    M. A. Chidambaram Stadium    Nigel Llong
Nitin Menon
753                            ACA-VDCA Stadium            NaN
NaN
754                            ACA-VDCA Stadium  Sundaram Ravi  Bruce
Oxenford
755         Rajiv Gandhi Intl. Cricket Stadium    Nitin Menon
Ian Gould

                      umpire3  match_id  total_runs
0                         NaN         1         207
4                         NaN         5         157
6                         NaN         7         178
7                         NaN         8         148
9                         NaN        10         158
..                        ...       ...         ...
751                    S Ravi     11347         143
752                 Ian Gould     11412         136
```

```
753                      NaN     11413         171
754  Chettithody Shamshuddin     11414         155
755              Nigel Llong     11415         152

[626 rows x 20 columns]
```

```
match_df = match_df[['match_id', 'city', 'winner', 'total_runs']]

delivery_df = match_df.merge(delivery, on='match_id')

delivery_df.head()
```

```
   match_id       city               winner  total_runs_x  inning  \
0         1  Hyderabad  Sunrisers Hyderabad           207       1
1         1  Hyderabad  Sunrisers Hyderabad           207       1
2         1  Hyderabad  Sunrisers Hyderabad           207       1
3         1  Hyderabad  Sunrisers Hyderabad           207       1
4         1  Hyderabad  Sunrisers Hyderabad           207       1

          batting_team                 bowling_team  over  ball
batsman  \
0  Sunrisers Hyderabad  Royal Challengers Bangalore     1     1  DA
Warner
1  Sunrisers Hyderabad  Royal Challengers Bangalore     1     2  DA
Warner
2  Sunrisers Hyderabad  Royal Challengers Bangalore     1     3  DA
Warner
3  Sunrisers Hyderabad  Royal Challengers Bangalore     1     4  DA
Warner
4  Sunrisers Hyderabad  Royal Challengers Bangalore     1     5  DA
Warner

   ... bye_runs legbye_runs  noball_runs  penalty_runs
batsman_runs  \
0  ...        0           0            0             0             0

1  ...        0           0            0             0             0

2  ...        0           0            0             0             4

3  ...        0           0            0             0             0

4  ...        0           0            0             0             0


   extra_runs  total_runs_y  player_dismissed  dismissal_kind  fielder

0           0             0               NaN             NaN      NaN

1           0             0               NaN             NaN      NaN
```

```
2           0              4                NaN              NaN      NaN

3           0              0                NaN              NaN      NaN

4           2              2                NaN              NaN      NaN


[5 rows x 24 columns]
```

```
delivery_df = delivery_df[delivery_df['inning'] == 2]

delivery_df.head()
```

```
     match_id       city               winner  total_runs_x  inning  \
125         1  Hyderabad  Sunrisers Hyderabad           207       2
126         1  Hyderabad  Sunrisers Hyderabad           207       2
127         1  Hyderabad  Sunrisers Hyderabad           207       2
128         1  Hyderabad  Sunrisers Hyderabad           207       2
129         1  Hyderabad  Sunrisers Hyderabad           207       2

                     batting_team         bowling_team  over  ball  \
125  Royal Challengers Bangalore  Sunrisers Hyderabad     1     1
126  Royal Challengers Bangalore  Sunrisers Hyderabad     1     2
127  Royal Challengers Bangalore  Sunrisers Hyderabad     1     3
128  Royal Challengers Bangalore  Sunrisers Hyderabad     1     4
129  Royal Challengers Bangalore  Sunrisers Hyderabad     1     5

            batsman  ... bye_runs legbye_runs  noball_runs
penalty_runs  \
125       CH Gayle  ...        0           0             0
0
126  Mandeep Singh  ...        0           0             0
0
127  Mandeep Singh  ...        0           0             0
0
128  Mandeep Singh  ...        0           0             0
0
129  Mandeep Singh  ...        0           0             0
0

     batsman_runs  extra_runs  total_runs_y  player_dismissed
dismissal_kind  \
125             1           0             1               NaN
NaN
126             0           0             0               NaN
NaN
127             0           0             0               NaN
NaN
128             2           0             2               NaN
NaN
129             4           0             4               NaN
```

```
NaN
```

```
     fielder
125      NaN
126      NaN
127      NaN
128      NaN
129      NaN

[5 rows x 24 columns]
```

```
delivery_df.shape
```

```
(72413, 24)
```

```
delivery_df.groupby('match_id')['total_runs_y'].cumsum()
```

```
125         1
126         1
127         1
128         3
129         7
         ...
149573    152
149574    154
149575    155
149576    157
149577    157
Name: total_runs_y, Length: 72413, dtype: int64
```

```
delivery_df['current_score'] = delivery_df.groupby('match_id')
['total_runs_y'].cumsum()
```

```
delivery_df
```

```
        match_id       city                winner  total_runs_x  inning
\
125            1  Hyderabad  Sunrisers Hyderabad           207       2

126            1  Hyderabad  Sunrisers Hyderabad           207       2

127            1  Hyderabad  Sunrisers Hyderabad           207       2

128            1  Hyderabad  Sunrisers Hyderabad           207       2

129            1  Hyderabad  Sunrisers Hyderabad           207       2

...          ...        ...                 ...           ...     ...

149573     11415  Hyderabad       Mumbai Indians           152       2

149574     11415  Hyderabad       Mumbai Indians           152       2
```

```
149575     11415  Hyderabad       Mumbai Indians           152       2

149576     11415  Hyderabad       Mumbai Indians           152       2

149577     11415  Hyderabad       Mumbai Indians           152       2


                        batting_team          bowling_team  over
ball  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad     1     1

126     Royal Challengers Bangalore  Sunrisers Hyderabad     1     2

127     Royal Challengers Bangalore  Sunrisers Hyderabad     1     3

128     Royal Challengers Bangalore  Sunrisers Hyderabad     1     4

129     Royal Challengers Bangalore  Sunrisers Hyderabad     1     5

...                             ...                   ...   ...   ...

149573          Chennai Super Kings       Mumbai Indians    20     2

149574          Chennai Super Kings       Mumbai Indians    20     3

149575          Chennai Super Kings       Mumbai Indians    20     4

149576          Chennai Super Kings       Mumbai Indians    20     5

149577          Chennai Super Kings       Mumbai Indians    20     6


              batsman  ... legbye_runs noball_runs  penalty_runs  \
125          CH Gayle  ...           0           0             0
126     Mandeep Singh  ...           0           0             0
127     Mandeep Singh  ...           0           0             0
128     Mandeep Singh  ...           0           0             0
129     Mandeep Singh  ...           0           0             0
...               ...  ...         ...         ...           ...
149573      RA Jadeja  ...           0           0             0
149574      SR Watson  ...           0           0             0
149575      SR Watson  ...           0           0             0
149576      SN Thakur  ...           0           0             0
149577      SN Thakur  ...           0           0             0

        batsman_runs  extra_runs  total_runs_y  player_dismissed  \
125                1           0             1               NaN
126                0           0             0               NaN
127                0           0             0               NaN
128                2           0             2               NaN
```

```
129                4           0             4               NaN
...              ...         ...           ...               ...
149573             1           0             1               NaN
149574             2           0             2               NaN
149575             1           0             1         SR Watson
149576             2           0             2               NaN
149577             0           0             0         SN Thakur

        dismissal_kind    fielder  current_score
125                NaN        NaN              1
126                NaN        NaN              1
127                NaN        NaN              1
128                NaN        NaN              3
129                NaN        NaN              7
...                ...        ...            ...
149573             NaN        NaN            152
149574             NaN        NaN            154
149575         run out  KH Pandya            155
149576             NaN        NaN            157
149577             lbw        NaN            157

[72413 rows x 25 columns]
```

```
delivery_df['runs_left'] = delivery_df['total_runs_x'] -
delivery_df['current_score']
```

```
delivery_df
```

```
        match_id       city               winner  total_runs_x  inning
\
125            1  Hyderabad  Sunrisers Hyderabad           207       2

126            1  Hyderabad  Sunrisers Hyderabad           207       2

127            1  Hyderabad  Sunrisers Hyderabad           207       2

128            1  Hyderabad  Sunrisers Hyderabad           207       2

129            1  Hyderabad  Sunrisers Hyderabad           207       2

...          ...        ...                  ...           ...     ...

149573     11415  Hyderabad       Mumbai Indians           152       2

149574     11415  Hyderabad       Mumbai Indians           152       2

149575     11415  Hyderabad       Mumbai Indians           152       2

149576     11415  Hyderabad       Mumbai Indians           152       2

149577     11415  Hyderabad       Mumbai Indians           152       2
```

```
                        batting_team          bowling_team  over
ball  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad     1     1

126     Royal Challengers Bangalore  Sunrisers Hyderabad     1     2

127     Royal Challengers Bangalore  Sunrisers Hyderabad     1     3

128     Royal Challengers Bangalore  Sunrisers Hyderabad     1     4

129     Royal Challengers Bangalore  Sunrisers Hyderabad     1     5

...                               ...                   ...   ...   ...

149573          Chennai Super Kings       Mumbai Indians    20     2

149574          Chennai Super Kings       Mumbai Indians    20     3

149575          Chennai Super Kings       Mumbai Indians    20     4

149576          Chennai Super Kings       Mumbai Indians    20     5

149577          Chennai Super Kings       Mumbai Indians    20     6


               batsman  ... noball_runs penalty_runs  batsman_runs
extra_runs  \
125          CH Gayle  ...           0            0             1
0
126     Mandeep Singh  ...           0            0             0
0
127     Mandeep Singh  ...           0            0             0
0
128     Mandeep Singh  ...           0            0             2
0
129     Mandeep Singh  ...           0            0             4
0
...               ...  ...         ...          ...           ...
...
149573      RA Jadeja  ...           0            0             1
0
149574      SR Watson  ...           0            0             2
0
149575      SR Watson  ...           0            0             1
0
149576      SN Thakur  ...           0            0             2
0
149577      SN Thakur  ...           0            0             0
0
```

```
        total_runs_y  player_dismissed  dismissal_kind    fielder  \
125                1               NaN             NaN        NaN
126                0               NaN             NaN        NaN
127                0               NaN             NaN        NaN
128                2               NaN             NaN        NaN
129                4               NaN             NaN        NaN
...              ...               ...             ...        ...
149573             1               NaN             NaN        NaN
149574             2               NaN             NaN        NaN
149575             1        SR Watson         run out  KH Pandya
149576             2               NaN             NaN        NaN
149577             0         SN Thakur             lbw        NaN

        current_score  runs_left
125                 1        206
126                 1        206
127                 1        206
128                 3        204
129                 7        200
...               ...        ...
149573            152          0
149574            154         -2
149575            155         -3
149576            157         -5
149577            157         -5

[72413 rows x 26 columns]
```

```
126 - (delivery_df['over']*6 + delivery_df['ball'])
```

```
125       119
126       118
127       117
128       116
129       115
         ...
149573      4
149574      3
149575      2
149576      1
149577      0
Length: 72413, dtype: int64
```

```
delivery_df['balls_left'] = 126 - (delivery_df['over']*6 +
delivery_df['ball'])
```

```
delivery_df
```

```
        match_id       city               winner  total_runs_x  inning
\
```

```
125            1  Hyderabad  Sunrisers Hyderabad           207       2
126            1  Hyderabad  Sunrisers Hyderabad           207       2
127            1  Hyderabad  Sunrisers Hyderabad           207       2
128            1  Hyderabad  Sunrisers Hyderabad           207       2
129            1  Hyderabad  Sunrisers Hyderabad           207       2
...          ...        ...                  ...           ...     ...
149573     11415  Hyderabad       Mumbai Indians           152       2
149574     11415  Hyderabad       Mumbai Indians           152       2
149575     11415  Hyderabad       Mumbai Indians           152       2
149576     11415  Hyderabad       Mumbai Indians           152       2
149577     11415  Hyderabad       Mumbai Indians           152       2

                        batting_team          bowling_team  over
ball  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad     1     1
126     Royal Challengers Bangalore  Sunrisers Hyderabad     1     2
127     Royal Challengers Bangalore  Sunrisers Hyderabad     1     3
128     Royal Challengers Bangalore  Sunrisers Hyderabad     1     4
129     Royal Challengers Bangalore  Sunrisers Hyderabad     1     5
...                             ...                  ...   ...   ...
149573          Chennai Super Kings       Mumbai Indians    20     2
149574          Chennai Super Kings       Mumbai Indians    20     3
149575          Chennai Super Kings       Mumbai Indians    20     4
149576          Chennai Super Kings       Mumbai Indians    20     5
149577          Chennai Super Kings       Mumbai Indians    20     6

              batsman  ... penalty_runs batsman_runs  extra_runs  \
125          CH Gayle  ...            0            1           0
126     Mandeep Singh  ...            0            0           0
```

```
127     Mandeep Singh  ...             0            0           0
128     Mandeep Singh  ...             0            2           0
129     Mandeep Singh  ...             0            4           0
...               ...  ...           ...          ...         ...
149573      RA Jadeja  ...             0            1           0
149574      SR Watson  ...             0            2           0
149575      SR Watson  ...             0            1           0
149576      SN Thakur  ...             0            2           0
149577      SN Thakur  ...             0            0           0

        total_runs_y  player_dismissed  dismissal_kind    fielder  \
125                1               NaN             NaN        NaN
126                0               NaN             NaN        NaN
127                0               NaN             NaN        NaN
128                2               NaN             NaN        NaN
129                4               NaN             NaN        NaN
...              ...               ...             ...        ...
149573             1               NaN             NaN        NaN
149574             2               NaN             NaN        NaN
149575             1         SR Watson         run out  KH Pandya
149576             2               NaN             NaN        NaN
149577             0         SN Thakur             lbw        NaN

        current_score  runs_left  balls_left
125                 1        206         119
126                 1        206         118
127                 1        206         117
128                 3        204         116
129                 7        200         115
...               ...        ...         ...
149573            152          0           4
149574            154         -2           3
149575            155         -3           2
149576            157         -5           1
149577            157         -5           0

[72413 rows x 27 columns]
```

```
delivery_df['player_dismissed'] =
delivery_df['player_dismissed'].fillna("0")
delivery_df['player_dismissed'] =
delivery_df['player_dismissed'].apply(lambda x:x if x == "0" else "1")
delivery_df['player_dismissed'] =
delivery_df['player_dismissed'].astype('int')

wickets = delivery_df.groupby('match_id')
['player_dismissed'].cumsum().values
delivery_df['wickets'] = 10 - wickets

delivery_df.head()
```

```
     match_id       city              winner  total_runs_x  inning  \
125         1  Hyderabad  Sunrisers Hyderabad           207       2
126         1  Hyderabad  Sunrisers Hyderabad           207       2
127         1  Hyderabad  Sunrisers Hyderabad           207       2
128         1  Hyderabad  Sunrisers Hyderabad           207       2
129         1  Hyderabad  Sunrisers Hyderabad           207       2

                    batting_team         bowling_team  over  ball  \
125  Royal Challengers Bangalore  Sunrisers Hyderabad     1     1
126  Royal Challengers Bangalore  Sunrisers Hyderabad     1     2
127  Royal Challengers Bangalore  Sunrisers Hyderabad     1     3
128  Royal Challengers Bangalore  Sunrisers Hyderabad     1     4
129  Royal Challengers Bangalore  Sunrisers Hyderabad     1     5

           batsman  ... player_dismissed dismissal_kind  fielder  \
125      CH Gayle  ...                1            NaN      NaN
126  Mandeep Singh  ...                1            NaN      NaN
127  Mandeep Singh  ...                1            NaN      NaN
128  Mandeep Singh  ...                1            NaN      NaN
129  Mandeep Singh  ...                1            NaN      NaN

     current_score  runs_left  balls_left  wickets  crr        rrr
result
125              1        206         119        9  6.0  10.386555
0
126              1        206         118        8  3.0  10.474576
0
127              1        206         117        7  2.0  10.564103
0
128              3        204         116        6  4.5  10.551724
0
129              7        200         115        5  8.4  10.434783
0

[5 rows x 31 columns]
```

```
# Creating crr column (current runrate (crr) = runs/over)

(delivery_df['current_score']*6) / (120 - delivery_df['balls_left'])
```

```
125       6.000000
126       3.000000
127       2.000000
128       4.500000
129       8.400000
            ...
149573    7.862069
149574    7.897436
149575    7.881356
149576    7.915966
```

```
149577    7.850000
Length: 72413, dtype: float64
```

```
delivery_df['crr'] = (delivery_df['current_score']*6) / (120 -
delivery_df['balls_left'])
```

```
delivery_df['batting_team'] = delivery_df['batting_team']
```

```
delivery_df
```

```
        match_id       city               winner  total_runs_x  inning
\
125            1  Hyderabad  Sunrisers Hyderabad           207       2

126            1  Hyderabad  Sunrisers Hyderabad           207       2

127            1  Hyderabad  Sunrisers Hyderabad           207       2

128            1  Hyderabad  Sunrisers Hyderabad           207       2

129            1  Hyderabad  Sunrisers Hyderabad           207       2

...          ...        ...                  ...           ...     ...

149573     11415  Hyderabad       Mumbai Indians           152       2

149574     11415  Hyderabad       Mumbai Indians           152       2

149575     11415  Hyderabad       Mumbai Indians           152       2

149576     11415  Hyderabad       Mumbai Indians           152       2

149577     11415  Hyderabad       Mumbai Indians           152       2


                        batting_team          bowling_team  over
ball  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad     1     1

126     Royal Challengers Bangalore  Sunrisers Hyderabad     1     2

127     Royal Challengers Bangalore  Sunrisers Hyderabad     1     3

128     Royal Challengers Bangalore  Sunrisers Hyderabad     1     4

129     Royal Challengers Bangalore  Sunrisers Hyderabad     1     5

...                             ...                  ...   ...   ...

149573          Chennai Super Kings       Mumbai Indians    20     2

149574          Chennai Super Kings       Mumbai Indians    20     3
```

```
149575          Chennai Super Kings       Mumbai Indians    20     4

149576          Chennai Super Kings       Mumbai Indians    20     5

149577          Chennai Super Kings       Mumbai Indians    20     6


               batsman  ... extra_runs total_runs_y
player_dismissed  \
125          CH Gayle  ...          0            1                0

126     Mandeep Singh  ...          0            0                0

127     Mandeep Singh  ...          0            0                0

128     Mandeep Singh  ...          0            2                0

129     Mandeep Singh  ...          0            4                0

...               ...  ...        ...          ...              ...

149573      RA Jadeja  ...          0            1                0

149574      SR Watson  ...          0            2                0

149575      SR Watson  ...          0            1                1

149576      SN Thakur  ...          0            2                0

149577      SN Thakur  ...          0            0                1


        dismissal_kind    fielder  current_score  runs_left
balls_left  \
125                NaN        NaN              1        206
119
126                NaN        NaN              1        206
118
127                NaN        NaN              1        206
117
128                NaN        NaN              3        204
116
129                NaN        NaN              7        200
115
...                ...        ...            ...        ...          ..
.
149573             NaN        NaN            152          0
4
149574             NaN        NaN            154         -2
3
```

```
149575         run out  KH Pandya            155          -3
2
149576             NaN        NaN            157          -5
1
149577             lbw        NaN            157          -5
0

        wickets       crr
125          10  6.000000
126          10  3.000000
127          10  2.000000
128          10  4.500000
129          10  8.400000
...         ...       ...
149573         5  7.862069
149574         5  7.897436
149575         4  7.881356
149576         4  7.915966
149577         3  7.850000

[72413 rows x 29 columns]
```

```
# Creating rrr column (Requaried runrate)

delivery_df['rrr'] =
(delivery_df['runs_left']*6)/delivery_df['balls_left']

delivery_df
```

```
        match_id       city                winner  total_runs_x  inning
\
125            1  Hyderabad  Sunrisers Hyderabad           207       2

126            1  Hyderabad  Sunrisers Hyderabad           207       2

127            1  Hyderabad  Sunrisers Hyderabad           207       2

128            1  Hyderabad  Sunrisers Hyderabad           207       2

129            1  Hyderabad  Sunrisers Hyderabad           207       2

...          ...        ...                 ...           ...     ...

149573     11415  Hyderabad       Mumbai Indians           152       2

149574     11415  Hyderabad       Mumbai Indians           152       2

149575     11415  Hyderabad       Mumbai Indians           152       2

149576     11415  Hyderabad       Mumbai Indians           152       2
```

```
149577     11415  Hyderabad       Mumbai Indians           152       2


                        batting_team         bowling_team  over
ball  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad     1     1

126     Royal Challengers Bangalore  Sunrisers Hyderabad     1     2

127     Royal Challengers Bangalore  Sunrisers Hyderabad     1     3

128     Royal Challengers Bangalore  Sunrisers Hyderabad     1     4

129     Royal Challengers Bangalore  Sunrisers Hyderabad     1     5

...                               ...                  ...   ...   ...

149573          Chennai Super Kings       Mumbai Indians    20     2

149574          Chennai Super Kings       Mumbai Indians    20     3

149575          Chennai Super Kings       Mumbai Indians    20     4

149576          Chennai Super Kings       Mumbai Indians    20     5

149577          Chennai Super Kings       Mumbai Indians    20     6


               batsman  ... total_runs_y player_dismissed
dismissal_kind  \
125          CH Gayle  ...            1                 0
NaN
126     Mandeep Singh  ...            0                 0
NaN
127     Mandeep Singh  ...            0                 0
NaN
128     Mandeep Singh  ...            2                 0
NaN
129     Mandeep Singh  ...            4                 0
NaN
...               ...  ...          ...               ...
..
149573      RA Jadeja  ...            1                 0
NaN
149574      SR Watson  ...            2                 0
NaN
149575      SR Watson  ...            1                 1         run
out
149576      SN Thakur  ...            2                 0
NaN
149577      SN Thakur  ...            0                 1
```

```
lbw

           fielder  current_score  runs_left  balls_left  wickets
crr  \
125            NaN              1        206         119       10
6.000000
126            NaN              1        206         118       10
3.000000
127            NaN              1        206         117       10
2.000000
128            NaN              3        204         116       10
4.500000
129            NaN              7        200         115       10
8.400000
...            ...            ...        ...         ...      ...
...
149573         NaN            152          0           4        5
7.862069
149574         NaN            154         -2           3        5
7.897436
149575  KH Pandya             155         -3           2        4
7.881356
149576         NaN            157         -5           1        4
7.915966
149577         NaN            157         -5           0        3
7.850000

                rrr
125      10.386555
126      10.474576
127      10.564103
128      10.551724
129      10.434783
...            ...
149573    0.000000
149574   -4.000000
149575   -9.000000
149576  -30.000000
149577        -inf

[72413 rows x 30 columns]
```

```python
def result(row):
    return 1 if row['batting_team'] == row['winner'] else 0

delivery_df.apply(result, axis=1)
```

```
125       0
126       0
127       0
```

```
128       0
129       0
         ..
149573    0
149574    0
149575    0
149576    0
149577    0
Length: 72413, dtype: int64
```

```
delivery_df['result'] = delivery_df.apply(result, axis=1)
```

```
delivery_df
```

```
        match_id       city               winner  total_runs_x  inning
\
125            1  Hyderabad  Sunrisers Hyderabad           207       2

126            1  Hyderabad  Sunrisers Hyderabad           207       2

127            1  Hyderabad  Sunrisers Hyderabad           207       2

128            1  Hyderabad  Sunrisers Hyderabad           207       2

129            1  Hyderabad  Sunrisers Hyderabad           207       2

...          ...        ...                  ...           ...     ...

149573     11415  Hyderabad       Mumbai Indians           152       2

149574     11415  Hyderabad       Mumbai Indians           152       2

149575     11415  Hyderabad       Mumbai Indians           152       2

149576     11415  Hyderabad       Mumbai Indians           152       2

149577     11415  Hyderabad       Mumbai Indians           152       2


                         batting_team          bowling_team  over
ball  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad     1     1

126     Royal Challengers Bangalore  Sunrisers Hyderabad     1     2

127     Royal Challengers Bangalore  Sunrisers Hyderabad     1     3

128     Royal Challengers Bangalore  Sunrisers Hyderabad     1     4

129     Royal Challengers Bangalore  Sunrisers Hyderabad     1     5
```

```
...                              ...                  ...   ...   ...
149573          Chennai Super Kings       Mumbai Indians    20     2
149574          Chennai Super Kings       Mumbai Indians    20     3
149575          Chennai Super Kings       Mumbai Indians    20     4
149576          Chennai Super Kings       Mumbai Indians    20     5
149577          Chennai Super Kings       Mumbai Indians    20     6

               batsman  ... player_dismissed dismissal_kind    fielder
\
125          CH Gayle  ...                 0            NaN        NaN
126     Mandeep Singh  ...                 0            NaN        NaN
127     Mandeep Singh  ...                 0            NaN        NaN
128     Mandeep Singh  ...                 0            NaN        NaN
129     Mandeep Singh  ...                 0            NaN        NaN
...               ...  ...               ...            ...        ...
149573      RA Jadeja  ...                 0            NaN        NaN
149574      SR Watson  ...                 0            NaN        NaN
149575      SR Watson  ...                 1        run out  KH Pandya
149576      SN Thakur  ...                 0            NaN        NaN
149577      SN Thakur  ...                 1            lbw        NaN

        current_score  runs_left  balls_left  wickets       crr
rrr  \
125                 1        206         119       10  6.000000
10.386555
126                 1        206         118       10  3.000000
10.474576
127                 1        206         117       10  2.000000
10.564103
128                 3        204         116       10  4.500000
10.551724
129                 7        200         115       10  8.400000
10.434783
...               ...        ...         ...      ...       ...
```

```
...
149573             152           0            4         5  7.862069
0.000000
149574             154          -2            3         5  7.897436  -
4.000000
149575             155          -3            2         4  7.881356  -
9.000000
149576             157          -5            1         4  7.915966 -
30.000000
149577             157          -5            0         3  7.850000
-inf

        result
125          0
126          0
127          0
128          0
129          0
...        ...
149573       0
149574       0
149575       0
149576       0
149577       0

[72413 rows x 31 columns]
```

```
# Joo Joo hume columns cahiye vo hum nikal lenge alag se
final_df = delivery_df[['batting_team', 'bowling_team', 'city',
'runs_left', 'balls_left', 'wickets', 'total_runs_x',
                        'crr', 'rrr', 'result']]

final_df
```

```
                      batting_team          bowling_team       city  \
125     Royal Challengers Bangalore  Sunrisers Hyderabad  Hyderabad
126     Royal Challengers Bangalore  Sunrisers Hyderabad  Hyderabad
127     Royal Challengers Bangalore  Sunrisers Hyderabad  Hyderabad
128     Royal Challengers Bangalore  Sunrisers Hyderabad  Hyderabad
129     Royal Challengers Bangalore  Sunrisers Hyderabad  Hyderabad
...                             ...                  ...        ...
149573          Chennai Super Kings       Mumbai Indians  Hyderabad
149574          Chennai Super Kings       Mumbai Indians  Hyderabad
149575          Chennai Super Kings       Mumbai Indians  Hyderabad
149576          Chennai Super Kings       Mumbai Indians  Hyderabad
149577          Chennai Super Kings       Mumbai Indians  Hyderabad

        runs_left  balls_left  wickets  total_runs_x       crr
rrr  \
125           206         119       10           207  6.000000
```

```
10.386555
126           206         118       10            207  3.000000
10.474576
127           206         117       10            207  2.000000
10.564103
128           204         116       10            207  4.500000
10.551724
129           200         115       10            207  8.400000
10.434783
...           ...         ...      ...            ...       ...
...
149573          0           4         5            152  7.862069
0.000000
149574         -2           3         5            152  7.897436  -
4.000000
149575         -3           2         4            152  7.881356  -
9.000000
149576         -5           1         4            152  7.915966 -
30.000000
149577         -5           0         3            152  7.850000       -
inf

        result
125          0
126          0
127          0
128          0
129          0
...        ...
149573       0
149574       0
149575       0
149576       0
149577       0

[72413 rows x 10 columns]
```

```
# Shuffling the data
final_df = final_df.sample(final_df.shape[0])

final_df
```

```
               batting_team                  bowling_team       city  \
60589      Rajasthan Royals              Mumbai Indians     Mumbai
106604      Kings XI Punjab          Chennai Super Kings    Chennai
27861   Chennai Super Kings             Rajasthan Royals  Kimberley
143466       Delhi Capitals              Mumbai Indians      Delhi
9112       Rajasthan Royals              Deccan Chargers  Hyderabad
...                     ...                         ...        ...
52611      Delhi Daredevils        Kolkata Knight Riders      Delhi
```

```
42969       Deccan Chargers  Royal Challengers Bangalore  Bangalore
40037   Chennai Super Kings  Royal Challengers Bangalore    Chennai
20818       Deccan Chargers        Kolkata Knight Riders  Cape Town
84021        Mumbai Indians          Sunrisers Hyderabad     Mumbai

        runs_left  balls_left  wickets  total_runs_x        crr
rrr  \
60589         143          78        8           197   7.714286
11.000000
106604         98           5        1           192   4.904348
117.600000
27861         115          89        9           140   4.838710
7.752809
143466         96          37        5           174   5.638554
15.567568
9112           94          55        8           214  11.076923
10.254545
...           ...         ...      ...           ...        ...
...
52611          32          14        4           148   6.566038
13.714286
42969         159          93        9           184   5.555556
10.258065
40037         133         104       10           161  10.500000
7.673077
20818         101         118       10           101   0.000000
5.135593
84021          65          29        6           178   7.450549
13.448276

        result
60589        0
106604       0
27861        1
143466       0
9112         1
...        ...
52611        0
42969        1
40037        1
20818        1
84021        1

[72413 rows x 10 columns]
```

```
# Example

final_df.sample()
```

```
                      batting_team           bowling_team
city  \
43680  Royal Challengers Bangalore  Kolkata Knight Riders  Bangalore


       runs_left  balls_left  wickets  total_runs_x   crr       rrr
result
43680        155         112       10           160  3.75  8.303571
1
```

```
final_df.isnull().sum()
```

```
batting_team      0
bowling_team      0
city            832
runs_left         0
balls_left        0
wickets           0
total_runs_x      0
crr               0
rrr               7
result            0
dtype: int64
```

```
final_df.dropna(inplace=True)
```

```
final_df.isnull().sum()
```

```
batting_team    0
bowling_team    0
city            0
runs_left       0
balls_left      0
wickets         0
total_runs_x    0
crr             0
rrr             0
result          0
dtype: int64
```

```
final_df = final_df[final_df['balls_left'] != 0]
```

```
# Building model

X = final_df.iloc[:,:-1]  # --> every rows & every columns except last
column (multiple indipendent variable)
y = final_df.iloc[:,-1]   # --> every rows & only last column (feature
column)

from sklearn.model_selection import train_test_split
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=1)

X_train
```

```
                        batting_team                  bowling_team
city  \
18032               Kings XI Punjab              Deccan Chargers
Chandigarh
122820          Sunrisers Hyderabad               Mumbai Indians
Hyderabad
40996               Rajasthan Royals          Chennai Super Kings
Chennai
49962         Kolkata Knight Riders              Rajasthan Royals
Jaipur
27183               Rajasthan Royals  Royal Challengers Bangalore
Centurion
...                              ...                           ...
...
86002               Rajasthan Royals          Sunrisers Hyderabad
Delhi
4343          Kolkata Knight Riders          Sunrisers Hyderabad
Hyderabad
80495               Kings XI Punjab          Chennai Super Kings
Chennai
2803                Delhi Daredevils          Sunrisers Hyderabad
Hyderabad
50138   Royal Challengers Bangalore          Chennai Super Kings
Chennai

        runs_left  balls_left  wickets  total_runs_x       crr
rrr
18032          36          23        7           175  8.597938
9.391304
122820        141         109       10           155  7.636364
7.761468
40996         231         110       10           246  9.000000
12.600000
49962           9          19        9           159  8.910891
2.842105
27183          41          57        8           105  6.095238
4.315789
...           ...         ...      ...           ...       ...
...
86002          89          85        9           132  7.371429
6.282353
4343          184          97        8           209  6.521739
11.381443
80495          52          23        7           186  8.288660
13.565217
```

```
2803          177         109        9           191  7.636364
9.743119
50138         138          76        7           183  6.136364
10.894737

[57073 rows x 9 columns]
```

```
from sklearn.compose import ColumnTransformer
from sklearn.preprocessing import OneHotEncoder

trf = ColumnTransformer([
    ('trf', OneHotEncoder(sparse_output=False, drop='first'),
     ['batting_team', 'bowling_team', 'city'])
],
remainder='passthrough')

# Logistic Regression

from sklearn.linear_model import LogisticRegression
from sklearn.pipeline import Pipeline

pipe = Pipeline(steps=[
    ('step1',trf),
    ('step2',LogisticRegression(solver='liblinear'))
])

pipe.fit(X_train, y_train)
```

```
Pipeline(steps=[('step1',
                 ColumnTransformer(remainder='passthrough',
                                   transformers=[('trf',

OneHotEncoder(drop='first',

sparse_output=False),
                                                  ['batting_team',
                                                   'bowling_team',
'city'])])),
                ('step2', LogisticRegression(solver='liblinear'))])

X_train.describe()
```

```
          runs_left    balls_left       wickets  total_runs_x
crr  \
count  57073.000000  57073.000000  57073.000000  57073.000000
57073.000000
mean      92.420987     62.723162      7.544198    165.681864
7.445987
std       49.918687     33.263697      2.129320     29.236209
2.270280
min      -16.000000     -2.000000      0.000000     65.000000
```

```
0.000000
25%       53.000000     35.000000      6.000000    147.000000
6.266667
50%       92.000000     63.000000      8.000000    165.000000
7.481481
75%      130.000000     91.000000      9.000000    185.000000
8.689655
max      249.000000    119.000000     10.000000    250.000000
42.000000
```

```
                rrr
count  57073.000000
mean      10.389483
std       13.666336
min     -462.000000
25%        7.161290
50%        8.884615
75%       10.888889
max      678.000000
```

```
y_pred = pipe.predict(X_test)
```

```
from sklearn.metrics import accuracy_score
accuracy_score(y_test, y_pred)
```

```
0.8098675450276824
```

```
pipe.predict_proba(X_test)[7]
```

```
array([0.22608104, 0.77391896])
```

```
# Random Forest
```

```
from sklearn.ensemble import RandomForestClassifier
from sklearn.pipeline import Pipeline

pipe = Pipeline(steps=[
    ('step1',trf),
    ('step2',RandomForestClassifier())
])

pipe.fit(X_train, y_train)
```

```
Pipeline(steps=[('step1',
                 ColumnTransformer(remainder='passthrough',
                                   transformers=[('trf',

OneHotEncoder(drop='first',

sparse_output=False),
                                                  ['batting_team',
                                                   'bowling_team',
```

```
'city'])])),
                ('step2', RandomForestClassifier())])

y_pred = pipe.predict(X_test)

from sklearn.metrics import accuracy_score
accuracy_score(y_test, y_pred)

0.9985282780853598

pipe.predict_proba(X_test)[7]

array([0.86, 0.14])

def match_progression(x_df, match_id, pipe):
    match = x_df[x_df['match_id'] == match_id]

    # Consider data only after the 6th ball
    match = match[(match['ball'] == 6)]

    # Select required features
    temp_df = match[['batting_team', 'bowling_team', 'city',
                     'runs_left', 'balls_left', 'wickets',
'total_runs_x','rrr', 'crr']]

    # Filter rows where balls_left is not zero
    temp_df = temp_df[temp_df['balls_left'] != 0]

    # Predict win probabilities using the trained model
    result = pipe.predict_proba(temp_df)

    # Add probabilities into dataframe
    temp_df['lose'] = np.round(result.T[0] * 100, 1)
    temp_df['win'] = np.round(result.T[1] * 100, 1)

    # Add over progression
    temp_df['end_of_over'] = range(1, temp_df.shape[0] + 1)

    # Target score
    target = temp_df['total_runs_x'].values[0]

    # Runs left
    runs = list(temp_df['runs_left'].values)
    new_runs = runs[:]
    runs.insert(0, target)

    # Calculate runs scored in each over
    temp_df['runs_after_over'] = np.array(runs)[:-1] -
np.array(new_runs)

    # Wickets fallen
    wickets = list(temp_df['wickets'].values)
```

```
    new_wickets = wickets[:]
    new_wickets.insert(0, 10)
    wickets.append(0)

    # Convert to numpy arrays
    w = np.array(wickets)
    nw = np.array(new_wickets)
    temp_df['wickets_in_over'] = (nw - w)[:temp_df.shape[0]]

    print('Target-', target)

    temp_df = temp_df[['end_of_over', 'runs_after_over',
'wickets_in_over', 'lose', 'win']]
    return temp_df, target

temp_df,target = match_progression(delivery_df,74,pipe)
temp_df
```

```
Target- 178
```

	end_of_over	runs_after_over	wickets_in_over	lose	win
10459	1	4	0	97.0	3.0
10467	2	8	0	100.0	0.0
10473	3	1	0	97.0	3.0
10479	4	7	1	98.0	2.0
10485	5	12	0	100.0	0.0
10491	6	13	0	97.0	3.0
10497	7	9	0	98.0	2.0
10505	8	15	0	97.0	3.0
10511	9	7	0	98.0	2.0
10518	10	17	0	100.0	0.0
10524	11	9	1	98.0	2.0
10530	12	9	0	99.0	1.0
10536	13	8	0	97.0	3.0
10542	14	8	0	93.0	7.0
10548	15	5	1	85.0	15.0
10555	16	8	1	67.0	33.0
10561	17	8	2	94.0	6.0
10567	18	6	1	99.0	1.0
10573	19	8	2	100.0	0.0

```
import matplotlib.pyplot as plt

plt.figure(figsize=(18,8))
plt.plot(temp_df['end_of_over'],temp_df['wickets_in_over'],color='yell
ow',linewidth=3)
plt.plot(temp_df['end_of_over'],temp_df['win'],color='#00a65a',linewid
th=4)
plt.plot(temp_df['end_of_over'],temp_df['lose'],color='red',linewidth=
4)
```

```
plt.bar(temp_df['end_of_over'], temp_df['runs_after_over'])
plt.title(f"Target - {target}")
```

```
Text(0.5, 1.0, 'Target - 178')
```