DBMS Project

IPL Database Scenario

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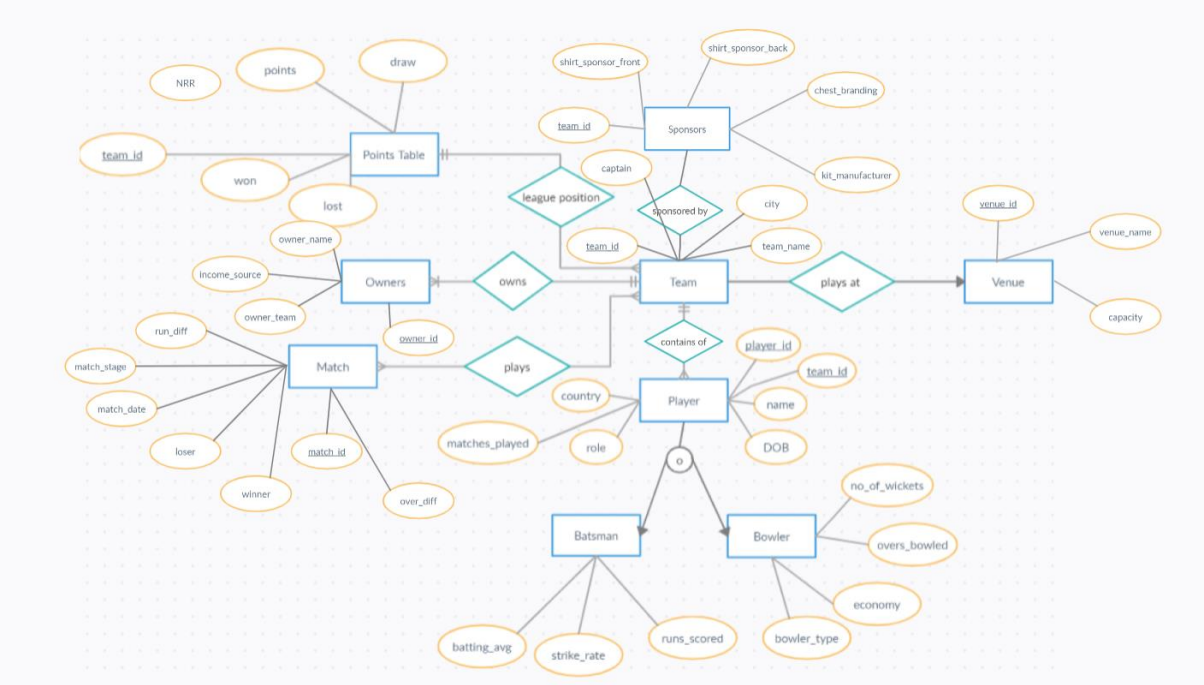
Creation of a database which contains the statistics of IPL 2020 if played in India.

1. **ER Diagram:**

We have

- ***Team*** entity contains attributes ***team_id, team_name, place,***
- ***Sponsors*** entity containing sponsors attributes
- ***Venue*** entity containing attributes about team venues
- ***Player*** entity with attributes of the player with two overlapping subclasses Batsman and Bowler
- ***Batsman*** subclass with attributes of batsmen
- ***Bowler*** subclass with attributes of bowlers
- ***Owner*** entity which contains owners of each team
- ***Match*** entity which contains details of each match
- ***Points Table*** entity which contains the IPL tournament standings



2. **Conversion of ER Diagram to Relational Schema:**

```
Enter user-name: system
Enter password:

Connected to:
Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit Production

SQL> create table team1(team_id integer PRIMARY KEY, team_name varchar(30) NOT NULL UNIQUE);

Table created.

SQL>
```

```
SQL> alter table team1 add city varchar(20) NOT NULL;

Table altered.

SQL> DESC TEAM1;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 TEAM_ID                                   NOT NULL NUMBER(38)
 TEAM_NAME                                 NOT NULL VARCHAR2(30)
 CITY                                      NOT NULL VARCHAR2(20)
```

Sponsor entity:

```
SQL> create table sponsors(team_id INTEGER NOT NULL, kit_manufacturer varchar(30),shirt_sponsor_front varchar(30),shirt_sponsor_back varchar(30), chest_branding varchar(30)
,FOREIGN KEY(team_id) REFERENCES team1(team_id));

Table created.

SQL>
```

```
SQL> desc sponsors;
 Name                                                                                                                Null?    Type
 ------------------------------------------------------------------------------------------------------------------- -------- ------------------------------------------------------------------------------------------------
 TEAM_ID                                                                                                             NOT NULL NUMBER(38)
 KIT_MANUFACTURER                                                                                                             VARCHAR2(30)
 SHIRT_SPONSOR_FRONT                                                                                                          VARCHAR2(30)
 SHIRT_SPONSOR_BACK                                                                                                           VARCHAR2(30)
 CHEST_BRANDING                                                                                                               VARCHAR2(30)
```

For ‘Venue’

```
SQL> create table Venue(venue_id integer PRIMARY KEY, venue name varchar(30), capacity integer);
```

```
SQL> desc venue;
 Name                                                                                                                Null?    Type
 ------------------------------------------------------------------------------------------------------------------- -------- ------------------------------------------------------------------------------------------------

 VENUE_ID                                                                                                            NOT NULL NUMBER(38)
 VENUE_NAME                                                                                                                   VARCHAR2(30)
 CAPACITY                                                                                                                     NUMBER(38)
```

Creating a ‘player’ entity

```
SQL> create table Player(player_id integer PRIMARY KEY, team_player integer NOT NULL, player_name varchar(20) NOT NULL, DOB date, country varchar(30), role varchar(20), mat
ches_played number, FOREIGN KEY(team_player) REFERENCES team1(team_id));

Table created.

SQL>
```

```
SQL> desc player;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PLAYER_ID                                 NOT NULL NUMBER(38)
 TEAM_PLAYER                               NOT NULL NUMBER(38)
 PLAYER_NAME                               NOT NULL VARCHAR2(20)
 DOB                                                DATE
 COUNTRY                                            VARCHAR2(30)
 ROLE                                               VARCHAR2(20)
 MATCHES_PLAYED                                     NUMBER
```

Creating ‘Batsman’ and ‘Bowler’ subclasses of ‘Player’

```
SQL> create table Batsman(player_id integer PRIMARY KEY, runs_scored number, strike_rate float, batting_avg float);
Table created.
SQL> create table Bowler(player_id integer PRIMARY KEY, no_of_wickets integer, overs_bowled integer, economy float, bowler_type varchar(20));
Table created.
SQL>
```

```
SQL> desc batsman;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PLAYER_ID                                 NOT NULL NUMBER(38)
 RUNS_SCORED                                        NUMBER
 STRIKE_RATE                                        FLOAT(126)
 BATTING_AVG                                        FLOAT(126)
```

```
SQL> desc bowler;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 PLAYER_ID                                 NOT NULL NUMBER(38)
 NO_OF_WICKETS                                      NUMBER(38)
 OVERS_BOWLED                                       NUMBER(38)
 ECONOMY                                            FLOAT(126)
 BOWLER_TYPE                                        VARCHAR2(20)
```

Creating ‘Owner’ entity linked to ‘Team’

```
SQL> create table Owner(owner_id integer PRIMARY KEY, owner_name varchar(20) NOT NULL UNIQUE, income_source varchar(30), owner_team integer NOT NULL, FOREIGN KEY(owner_team
) REFERENCES team1(team_id));
Table created.
SQL>
```

```
SQL> desc owner;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 OWNER_ID                                  NOT NULL NUMBER(38)
 OWNER_NAME                                NOT NULL VARCHAR2(20)
 INCOME_SOURCE                                      VARCHAR2(30)
 OWNER_TEAM                                NOT NULL NUMBER(38)

SQL>
```

Points Table entity

```
SQL> create table points_table(team_id integer PRIMARY KEY, team_name varchar(20) UNIQUE NOT NULL, played integer, won integer, lost integer, points integer, FOREIGN KEY(te
am_name) REFERENCES team1(team_name));
Table created.
SQL>
```

```
SQL> desc points_table;
 Name                                      Null?    Type
 ----------------------------------------- -------- ----------------------------
 TEAM_ID                                   NOT NULL NUMBER(38)
 TEAM_NAME                                 NOT NULL VARCHAR2(20)
 PLAYED                                             NUMBER(38)
 WON                                                NUMBER(38)
 LOST                                               NUMBER(38)
 POINTS                                             NUMBER(38)
```

Match entity:

```
SQL> desc match;
 Name                                                                                                Null?    Type
 ----------------------------------------------------------------------------------------------------- -------- ------------------------------------------------------------

 MATCH_ID                                                                                            NOT NULL NUMBER(38)
 WINNER                                                                                                       VARCHAR2(30)
 LOSER                                                                                                        VARCHAR2(30)
 MATCH_STAGE                                                                                         NOT NULL VARCHAR2(15)
 MATCH_DATE                                                                                                   DATE
 RUN_DIFF                                                                                                     FLOAT(126)
 OVER_DIFF                                                                                                    FLOAT(126)
```

3. Insertion of data in all tables in the database:

In team 1 entity:

```
SQL> SELECT * FROM TEAM1;

   TEAM_ID TEAM_NAME                      CITY                 CEO                  CAPTAIN              HEAD_COACH
---------- ---------------------------- -------------------- -------------------- -------------------- ----------------------
         1 Chennai Super Kings          Chennai,Tamil Nadu   Kasi Viswanathan     MS Dhoni             Stephen Fleming
         2 Mumbai Indians               Mumbai,Maharashtra   Prakash Iyer         Rohit Sharma         Mahela Jayawardene
         3 Royal Challengers Bangalore  Bangalore,Karnataka  Brijesh Patel        Virat Kohli          Simon Katich
         4 Sunrisers Hyderabad          Hyderabad,Telengana  K Shanmugam          David Warner         Trevor Bayliss
         5 Kings XI Punjab              Mohali,Punjab        Sathish Menon        KL Rahul             Anil Kumble
         6 Rajasthan Royals             Jaipur,Rajasthan     Ranjit Barthakur     Steve Smith          Paddy Upton
         7 Delhi Capitals               New Delhi            Dheeraj Malhotra     Shreyas Iyer         Ricky Ponting
         8 Kolkata Knight Riders        Kolkata,West Bengal  Venky Mysore         Eoin Morgan          Brendon Mccullum

8 rows selected.
```

In sponsor entity

```
SQL> select * from sponsors;

   TEAM_ID KIT_MANUFACTURER             SHIRT_SPONSOR_FRONT          SHIRT_SPONSOR_BACK           CHEST_BRANDING
---------- ---------------------------- ---------------------------- ---------------------------- ----------------------------
         1 SEVEN                        Muthoot Group                India Cements                Gulf Oil
         2 Performax                    Samsung                      Colors                       Mariott Bonvoy
         3 Wrogn Active                 Muthoot Fincorp              DP World                     Myntra
         4 TYKA Sports                  JK Lakshmi Cement            RALCO Tyres                  Valvoline
         5 T10 Sports                   Ebixcash                     Avon Cycles                  Jio
         6 Alcis Sports                 TV9 Bharatvarsh              Nine                         KEI Wires Cables
         7 SQAD Gear                    JSW Group                    Ebixcash                     APL Apollo Steel Tubes
         8 Lux Cozi                     MPL                          JIO                          Lux Cozi

8 rows selected.
```

In owner entity

```
SQL> select * from owner;

  OWNER_ID OWNER_NAME                     INCOME_SOURCE                OWNER_TEAM BUDGET
---------- ------------------------------ ---------------------------- ---------- ---------------
         1 India Cements                  cement industry                       1 84.85 crores
        11 Ness Wadia                     businessman                           5 68.50 crores
        12 Preity Zinta                   film actor                            5 68.50 crores
         2 Reliance Industries            telecommunications                    2 83.05 crores
         3 United Spirits                 alcoholic beverages                   3 78.60 crores
         4 Sun TV Network                 media network                         4 74.90 crores
         5 Mohit Burman                   businessman                           5 68.50 crores
         6 Manoj Badale                   businessman                           6 70.25 crores
         7 GMR Group                      infrastructure sector                 7 76.00 crores
         8 JSW Group                      business conglomerate                 7 76.00 crores
         9 Red Chillies Entertainment     film distribution                     8 76.50 crores
        10 Mehta Group                    business conglomerate                 8 76.50 crores
```

In match entity

```
SQL> select * from match;

  MATCH_ID WINNER                         LOSER                         MATCH_STAGE     MATCH_DAT
---------- ------------------------------ ----------------------------- --------------- ---------
         1 Chennai Super Kings            Mumbai Indians                league          19-SEP-20
         2 Delhi Capitals                 Kings XI Punjab               league          20-SEP-20
         3 Sunrisers Hyderabad            Royal Challengers Bangalore   league          21-SEP-20
         4 Rajasthan Royals               Chennai Super Kings           league          22-SEP-20
         5 Mumbai Indians                 Kolkata Knight Riders         league          23-SEP-20
         6 Kings XI Punjab                Royal Challengers Bangalore   league          24-SEP-20
         7 Delhi Capitals                 Chennai Super Kings           league          25-SEP-20
         8 Kolkata Knight Riders          Sunrisers Hyderabad           league          26-SEP-20
         9 Rajasthan Royals               Kings XI Punjab               league          27-SEP-20
        10 Royal Challengers Bangalore    Mumbai Indians                league          28-SEP-20
        11 Sunrisers Hyderabad            Delhi Capitals                league          29-SEP-20
        12 Kolkata Knight Riders          Rajasthan Royals              league          30-SEP-20
        13 Mumbai Indians                 Kings XI Punjab               league          01-OCT-20
        14 Sunrisers Hyderabad            Chennai Super Kings           league          02-OCT-20
        15 Royal Challengers Bangalore    Rajasthan Royals              league          03-OCT-20
        16 Delhi Capitals                 Kolkata Knight Riders         league          03-OCT-20
        17 Mumbai Indians                 Sunrisers Hyderabad           league          04-OCT-20
        18 Chennai Super Kings            Kings XI Punjab               league          04-OCT-20
        19 Delhi Capitals                 Royal Challengers Bangalore   league          05-OCT-20
        20 Kolkata Knight Riders          Rajasthan Royals              league          06-OCT-20
        21 Delhi Capitals                 Kolkata Knight Riders         qualifier1      07-OCT-20
        22 Mumbai Indians                 Sunrisers Hyderabad           eliminator      07-OCT-20
        23 Mumbai Indians                 Kolkata Knight Riders         qualifier2      08-OCT-20
        24 Mumbai Indians                 Delhi Captitals               final           09-OCT-20

24 rows selected.
```

```
SQL> select * from match;

  MATCH_ID WINNER                         LOSER                         MATCH_STAGE     MATCH_DAT   RUN_DIFF  OVER_DIFF
---------- ------------------------------ ----------------------------- --------------- --------- ---------- ----------
         1 Chennai Super Kings            Mumbai Indians                league          19-SEP-20          4         .8
         2 Delhi Capitals                 Kings XI Punjab               league          20-SEP-20          0          0
         3 Sunrisers Hyderabad            Royal Challengers Bangalore   league          21-SEP-20         10         .6
         4 Rajasthan Royals               Chennai Super Kings           league          22-SEP-20         16          0
         5 Mumbai Indians                 Kolkata Knight Riders         league          23-SEP-20         49          0
         6 Kings XI Punjab                Royal Challengers Bangalore   league          24-SEP-20        103          3
         7 Delhi Capitals                 Chennai Super Kings           league          25-SEP-20         44          0
         8 Kolkata Knight Riders          Sunrisers Hyderabad           league          26-SEP-20          3          2
         9 Rajasthan Royals               Kings XI Punjab               league          27-SEP-20          3         .7
        10 Royal Challengers Bangalore    Mumbai Indians                league          28-SEP-20          0          0
        11 Sunrisers Hyderabad            Delhi Capitals                league          29-SEP-20         15          0
        12 Kolkata Knight Riders          Rajasthan Royals              league          30-SEP-20         37          0
        13 Mumbai Indians                 Kings XI Punjab               league          01-OCT-20         48          0
        14 Sunrisers Hyderabad            Chennai Super Kings           league          02-OCT-20          7          0
        15 Royal Challengers Bangalore    Rajasthan Royals              league          03-OCT-20          4         .9
        16 Delhi Capitals                 Kolkata Knight Riders         league          03-OCT-20         18          0
        17 Mumbai Indians                 Sunrisers Hyderabad           league          04-OCT-20         34          0
        18 Chennai Super Kings            Kings XI Punjab               league          04-OCT-20          3        2.2
        19 Delhi Capitals                 Royal Challengers Bangalore   league          05-OCT-20         59          0
        20 Kolkata Knight Riders          Rajasthan Royals              league          06-OCT-20         57        1.5
        21 Delhi Capitals                 Kolkata Knight Riders         qualifier1      07-OCT-20
        22 Mumbai Indians                 Sunrisers Hyderabad           eliminator      07-OCT-20
        23 Mumbai Indians                 Kolkata Knight Riders         qualifier2      08-OCT-20
        24 Mumbai Indians                 Delhi Captitals               final           09-OCT-20

24 rows selected.
```

In player entity

```
SQL> select * from player;

 PLAYER_ID TEAM_PLAYER PLAYER_NAME               AGE COUNTRY                        ROLE                 MATCHES_PLAYED
---------- ----------- -------------------- ---------- ------------------------------ -------------------- --------------
         1           1 MS Dhoni                     39 IND                            bat                             204
         2           1 FAF du Plessis               36 RSA                            bat                              84
         3           1 Shane Watson                 39 AUS                            bat                             145
         4           1 Ruturaj Gaikwad              23 IND                            bat                               6
         5           1 Ambati Rayudu                35 IND                            bat                             159
         6           1 Sam Curran                   22 UK                             bat/bowl                         23
         7           1 Jadhav                       35 IND                            bat                              87
         8           1 Bravo                        39 WI                             bat/bowl                        140
         9           1 Chahar                       28 IND                            bat/bowl                         48
        10           1 Thakur                       29 IND                            bat/bowl                         45
        11           1 Chawla                       31 IND                            bat/bowl                        164
        12           1 Tahir                        41 RSA                            bat/bowl                         58
        13           2 Rohit Sharma                 33 IND                            bat/bowl                        200
        14           2 Hardik Pandya                27 IND                            bat                              80
        15           2 Ishan Kishan                 22 IND                            bat                              51
        16           2 Kieron Pollard               33 IND                            bat/bowl                        164
        17           2 Jasprit Bumrah               26 IND                            bat/bowl                         92
        18           2 Quintin De Kock              27 IND                            bat                              66
        19           2 Chris Lynn                   30 AUS                            bat                              41
        20           2 Suryakumar Yadav             30 IND                            bat                             101
        21           2 Trent Boult                  31 NZ                             bat/bowl                         48
        22           2 Dhawal Kulkarni              31 IND                            bat/bowl                         91
        23           2 Mitchell Mcclenaghan         34 NZ                             bat/bowl                         56
        24           2 Krunal Pandya                29 IND                            bat/bowl                         71
        25           3 Virat Kohli                  31 IND                            bat                             192
        26           3 AB De Villiers               36 RSA                            bat                             169
        27           3 Devdutt Padikkal             20 IND                            bat                              15
        28           3 Aaron Finch                  33 AUS                            bat                              87
        29           3 Washington Sundar            21 IND                            bat                              36
        30           3 Yuzvendra Chahal             30 IND                            bat/bowl                         99
        31           3 Parthiv Patel                35 IND                            bat/bowl                        139
        32           3 Dale Steyn                   37 RSA                            bat/bowl                         95
        33           3 Umesh Yadav                  33 IND                            bat/bowl                        121
        34           3 Mohammad Siraj               26 IND                            bat/bowl                         35
        35           3 Chirs Morris                 33 RSA                            bat/bowl                         70
        36           4 David Warner                 34 AUS                            bat                             142
        37           4 Manish Pandey                31 IND                            bat                             146
        38           4 Kane Williamson              30 NZ                             bat                              53
        39           4 Mohammad Nabi                35 AFG                            bat/bowl                         14
        40           4 Vijay Shankar                29 IND                            bat/bowl                         40
        41           4 Jason Holder                 29 WI                             bat/bowl                         18
        42           4 Wriddhiman Saha              36 IND                            bat                             124
        43           4 Jonny Bairstow               31 ENG                            bat                              21
```

```
        43          4 Jonny Bairstow              31 ENG                  bat                          21
        44          4 Rashid Khan                 22 AFG                  bat/bowl                     62
        45          4 Shahbaaz Nadeem             31 IND                  bat/bowl                     71
        46          4 Siddharth Kaul              30 IND                  bat/bowl                     46
        47          5 Chris Gayle                 41 WI                   bat                         132
        48          5 KL Rahul                    28 IND                  bat                          81
        49          5 Glenn Maxwell               32 AUS                  bat/bowl                     82
        50          5 James Neesham               30 NZ                   bat/bowl                      9
        51          5 Nicolas Pooran              25 TNT                  bat                          21
        52          5 Mohammad Shami              20 IND                  bat                          63
        53          5 Chris Jordan                32 BAR                  bat/bowl                     20
        54          5 Sheldon Cottrell            31 WI                   bat/bowl                      6
        55          5 Krishnappa Gowtham          32 IND                  bat/bowl                     24
        56          5 Karun Nair                  28 IND                  bat                          73
        57          6 Steve Smith                 31 AUS                  bat                          95
        58          6 Ben Stokes                  29 ENG                  bat/bowl                     42
        59          6 David Miller                31 RSA                  bat                          80
        60          6 Rahul Tewatia               27 IND                  bat                          34
        61          6 Robin Uthappa               35 IND                  bat                         189
        62          6 Sanju Samson                26 IND                  bat                         107
        63          6 Jos Buttler                 30 ENG                  bat                          58
        64          6 Jofra Archer                25 ENG                  bat/bowl                     35
        65          6 Varun Aaron                 31 IND                  bat/bowl                     50
        66          6 Jaydev Unadkat              29 IND                  bat/bowl                     80
        67          6 Ankit Rajpoot               26 IND                  bat/bowl                     29
        68          7 Shreyas Iyer                25 IND                  bat                          79
        69          7 Shikhar Dhawan              34 IND                  bat                         176
        70          7 Ajinkya Rahane              32 IND                  bat                         149
        71          7 Prithvi Shaw                21 IND                  bat                          38
        72          7 Rishabh Pant                23 IND                  bat                          68
        73          7 Marcus Stoinis              31 AUS                  bat/bowl                     46
        74          7 Axar Patel                  26 IND                  bat/bowl                     97
        75          7 Ravichandran Ashwin         34 IND                  bat/bowl                    154
        76          7 Kagiso Rabada               25 IND                  bat/bowl                     61
        77          7 Anrich Nortje               26 RSA                  bat/bowl                     16
        78          8 Dinesh Karthik              35 IND                  bat                         196
        79          8 Eoin Morgan                 36 IRE                  bat                          66
        80          8 Nitish Rana                 26 IND                  bat                          60
        81          8 Andre Russell               32 WI                   bat/bowl                     74
        82          8 Sunil Narine                32 WI                   bat/bowl                    120
        83          8 Kuldeep Yadav               25 IND                  bat/bowl                     45
        84          8 Varun Chakravarthy          29 IND                  bat/bowl                     14
        85          8 Lockie Ferguson             29 NZ                   bat/bowl                     14
        86          8 Pat Cummins                 27 AUS                  bat/bowl                     30

86 rows selected.
```

In batsman entity

```
SQL> select * from batsman;

 PLAYER_ID RUNS_SCORED STRIKE_RATE BATTING_AVG
---------- ----------- ----------- -----------
         1        4632       136.4          41
         2        2302       129.2        32.9
         3        3874       137.9          31
         4         204       120.7          51
         5        3659       126.1        29.5
         6         281       143.4        23.4
         7        1141       124.2        22.8
         8        1490       128.2        22.6
         9        1271        22.2        28.2
        10        1340        19.6        29.1
        11        4263        20.8        27.3
        12        1687        16.1        21.1
        13        5280       130.6        31.3
        14        1349       159.3          30
        15        1211       136.8        28.8
        16        3023       149.9        29.9
        17          40        97.6        13.7
        18        1959       133.5        31.6
        19        1280       140.5        33.7
        20        2024       134.6        30.2
        21          12          80           4
        22         104        96.3        11.6
        23          85       121.4         6.5
        24        1000       142.4          25
        25        5878       130.7        38.2
        26        4849       151.9        40.4
        27         473       124.8        31.5
        28        2005       127.7        25.7
        29         186       125.7        15.5
        30          22        43.1         3.7
        31        2848       120.8        22.6
        32         167       104.4         7.6
        33         122        95.3         8.7
        34          46          92        11.5
        35         551       157.9        23.9
        36        5254       141.5        42.7
        37        3268       121.7        29.7
        38        1619       134.8        39.5
        39         146       147.5        16.2
        40         654       127.7        29.7
        41         104       123.8        14.8
        42        1979        25.7         132
        43         790       142.3        41.6
        44         139       149.5         8.7
        45          39        45.3           3
        46          12        42.9           3
        47        4772       150.1        41.1
        48        2647       135.8        44.9
        49        1505       154.7        22.1
        50          61        95.3        12.2
```

```
        50          61        95.3        12.2
        51         521       165.4        32.6
        52          56         100         5.6
        53          32        88.9         6.4
        55         186         169        14.3
        56        1480       128.4        24.3
        57        2333       129.2        35.3
        58         920       135.1        26.3
        59        1850       138.8        33.6
        60         366       134.6        30.5
        61        4607         130        27.9
        62        2584       133.7        27.8
        63        1714       149.6          25
        64         195       157.2          15
        65          50        69.4          10
        66          64        95.5         9.1
        68        2200       126.1        31.4
        69        5197       126.9        34.4
        70        3933       124.1        31.7
        71         826       139.8        21.7
        72        2079         152        35.2
        73         825       137.3        28.4
        74         913       127.7        18.3
        75         412       110.5        10.8
        76         125        97.7        12.5
        78        3823       129.6          26
        79        1272       126.3        25.4
        80        1437       135.6        28.2
        81        1517       182.3        29.7
        82         892       164.3        16.8
        86         223       131.9        17.1

80 rows selected.
```

In bowler entity

```
SQL> select * from bowler;

 PLAYER_ID NO_OF_WICKETS OVERS_BOWLED    ECONOMY BOWLER_TYPE
---------- ------------- ------------ ---------- --------------------
         6            45          400       7.62 28.2
         8           153         2700        8.4 24.81
         9            23          450       8.89 29
        10            46          500       8.92 29.1
        11           156         3000       7.87 27.3
        12            80         1650       7.83 21.1
        14            42          400       9.06 31.3
        16            60          905       8.87 32.7
        17           109         1500       7.41 23.7
        21            63          804       8.53 25
        22            86         1023       8.25 28.2
        23            71         1023       8.49 25.4
        24            46          700       7.26 32.8
        29            24          450       6.87 31.2
        30           121          893       7.67 22.5
        32            97          768       6.91 25.9
        33           119          678       8.51 30.1
        34            39          243       9.08 27.8
        35            80         1098       7.81 24
        39            11          202       6.54 29.3
        40             6           90       8.42 38.2
        41            19          270       8.42 28.4
        44            75          644       6.24 20.5
        45            47          342       7.53 37.2
        46            51          605       8.65 28.4
        49            19          195       8.57 41
        52            60          807       8.89 33.5
        53            21          810       9.33 28.7
        54             6           80        8.8 29.3
        55            13          109       8.26 43.2
        58            28          454       8.52 34.4
        60            24          214       7.13 28.3
        64            46          225       7.13 21.3
        65            42          105       8.89 34
        66            81          402       8.83 29.9
        67            24          197       9.23 33.9
        73            28          165       9.37 30.4
        74            80          162       7.29 30.7
        75           138          750       6.87 26.8
        76            61          255       8.23 18.1
        77            22          123       8.39 23.3
        81            61          330       8.96 28.1
        82           127          606       6.77 24.8
        83            40          244       8.27 30.9
        84            18          244        7.1 21.7
        85            11          110        8.5 38.5
        86            29          110          8 31.3

47 rows selected.
```

Venue entity:

```
SQL> select * from Venue;

  VENUE_ID VENUE_NAME                      CAPACITY
---------- ------------------------------ ----------
         1 Chidambaram Stadium                 50000
         2 Wankhede Stadium                    45000
         3 Chinnaswamy Stadium                 40000
         4 Rajiv Gandhi Stadium                55000
         5 PCA Stadium                         30000
         6 Sawai Mansingh Stadium              30000
         7 Arun Jaitley Stadium                48000
         8 Eden Gardens                        90000

8 rows selected.
```

Points Table: (initial)

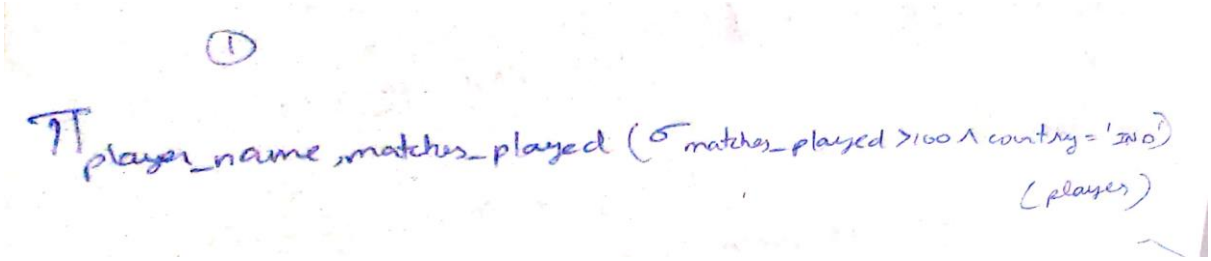
```
SQL> select * from points_table;

   TEAM_ID TEAM_NAME                      PLAYED        WON       LOST     POINTS        NRR
---------- ------------------------------ ---------- ---------- ---------- ---------- ----------
         1 Chennai Super Kings                 0          0          0          0          0
         2 Mumbai Indians                      0          0          0          0          0
         3 Royal Challengers Bangalore         0          0          0          0          0
         4 Sunrisers Hyderabad                 0          0          0          0          0
         5 Kings XI Punjab                     0          0          0          0          0
         6 Rajasthan Royals                    0          0          0          0          0
         7 Delhi Capitals                      0          0          0          0          0
         8 Kolkata Knight Riders               0          0          0          0          0

8 rows selected.
```

Queries

1. And

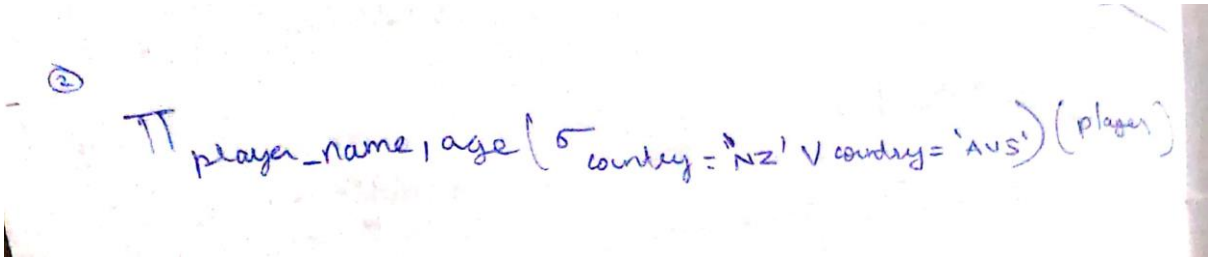
   Selecting player name, number of matches played for Indian players who have played more than 100 matches

```
SQL> select player_name,matches_played from player where matches_played>100 and country='IND';

PLAYER_NAME          MATCHES_PLAYED
-------------------- --------------
MS Dhoni                        204
Ambati Rayudu                   159
Chawla                          164
Rohit Sharma                    200
Kieron Pollard                  164
Suryakumar Yadav                101
Virat Kohli                     192
Parthiv Patel                   139
Umesh Yadav                     121
Manish Pandey                   146
Wriddhiman Saha                 124
Robin Uthappa                   189
Sanju Samson                    107
Shikhar Dhawan                  176
Ajinkya Rahane                  149
Ravichandran Ashwin             154
Dinesh Karthik                  196

17 rows selected.
```



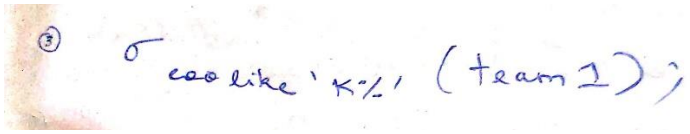
2. OR operator

```
SQL> select player_name,age from player where country='NZ' or country='AUS';

PLAYER_NAME                   AGE
-------------------- ----------
Shane Watson                   39
Chris Lynn                     30
Trent Boult                    31
Mitchell Mcclenaghan           34
Aaron Finch                    33
David Warner                   34
Kane Williamson                30
Glenn Maxwell                  32
James Neesham                  30
Steve Smith                    31
Marcus Stoinis                 31
Lockie Ferguson                29
Pat Cummins                    27

13 rows selected.
```



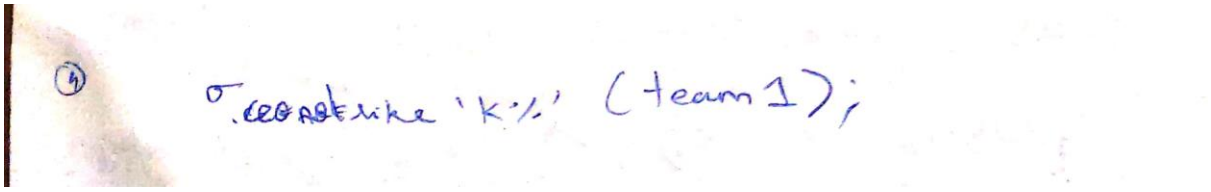
3. LIKE

```
SQL> select * from team1 where ceo like 'K%';

   TEAM_ID TEAM_NAME                     CITY                 CEO                            CAPTAIN                        HEAD_COACH
---------- ------------------------------ -------------------- ------------------------------ ------------------------------ ------------------------------
         1 Chennai Super Kings            Chennai,Tamil Nadu   Kasi Viswanathan               MS Dhoni                       Stephen Fleming
         4 Sunrisers Hyderabad            Hyderabad,Telengana  K Shanmugam                    David Warner                   Trevor Bayliss

SQL>
```



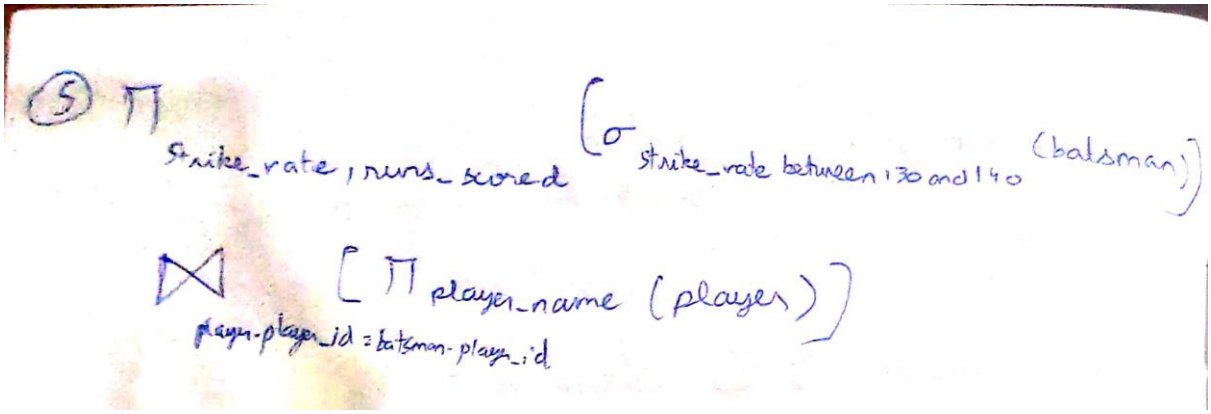
4. Not like

```
SQL> select * from team1 where ceo not like 'K%';

   TEAM_ID TEAM_NAME                     CITY                 CEO                            CAPTAIN                        HEAD_COACH
---------- ------------------------------ -------------------- ------------------------------ ------------------------------ ------------------------------
         2 Mumbai Indians                 Mumbai,Maharashtra   Prakash Iyer                   Rohit Sharma                   Mahela Jayawardene
         3 Royal Challengers Bangalore    Bangalore,Karnataka  Brijesh Patel                  Virat Kohli                    Simon Katich
         5 Kings XI Punjab                Mohali,Punjab        Sathish Menon                  KL Rahul                       Anil Kumble
         6 Rajasthan Royals               Jaipur,Rajasthan     Ranjit Barthakur               Steve Smith                    Paddy Upton
         7 Delhi Capitals                 New Delhi            Dheeraj Malhotra               Shreyas Iyer                   Ricky Ponting
         8 Kolkata Knight Riders          Kolkata,West Bengal  Venky Mysore                   Eoin Morgan                    Brendon Mccullum

6 rows selected.
```



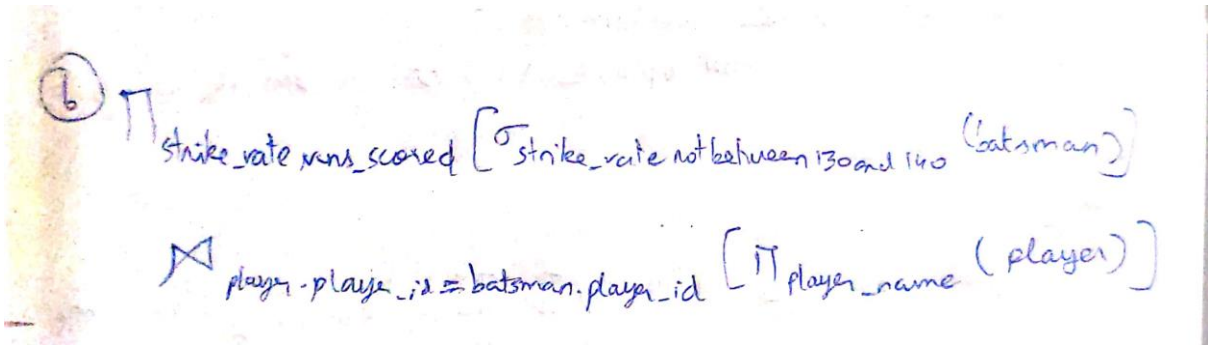
5. Between

```
SQL> select player_name,strike_rate,runs_scored from player,batsman where player.player_id=batsman.player_id and batsman.strike_rate between 130 and 140;

PLAYER_NAME          STRIKE_RATE RUNS_SCORED
-------------------- ----------- -----------
MS Dhoni                   136.4        4632
Shane Watson               137.9        3874
Rohit Sharma               130.6        5280
Ishan Kishan               136.8        1211
Quintin De Kock            133.5        1959
Suryakumar Yadav           134.6        2024
Virat Kohli                130.7        5878
Kane Williamson            134.8        1619
KL Rahul                   135.8        2647
Ben Stokes                 135.1         920
David Miller               138.8        1850
Rahul Tewatia              134.6         366
Robin Uthappa                130        4607
Sanju Samson               133.7        2584
Prithvi Shaw               139.8         826
Marcus Stoinis             137.3         825
Nitish Rana                135.6        1437
Pat Cummins                131.9         223

18 rows selected.
```



6. Not between

```
SQL> select player_name,strike_rate,runs_scored from player,batsman where player.player_id=batsman.player_id and batsman.strike_rate not between 30 and 150;

PLAYER_NAME          STRIKE_RATE RUNS_SCORED
-------------------- ----------- -----------
Chahar                      22.2        1271
Thakur                      19.6        1340
Chawla                      20.8        4263
Tahir                       16.1        1687
Hardik Pandya              159.3        1349
AB De Villiers             151.9        4849
Chris Morris               157.9         551
Wriddhiman Saha             25.7        1979
Chris Gayle                150.1        4772
Glenn Maxwell              154.7        1505
Nicolas Pooran             165.4         521
Krishnappa Gowtham           169         186
Jofra Archer               157.2         195
Rishabh Pant                 152        2079
Andre Russell              182.3        1517
Sunil Narine               164.3         892

16 rows selected.
```



7. Exists

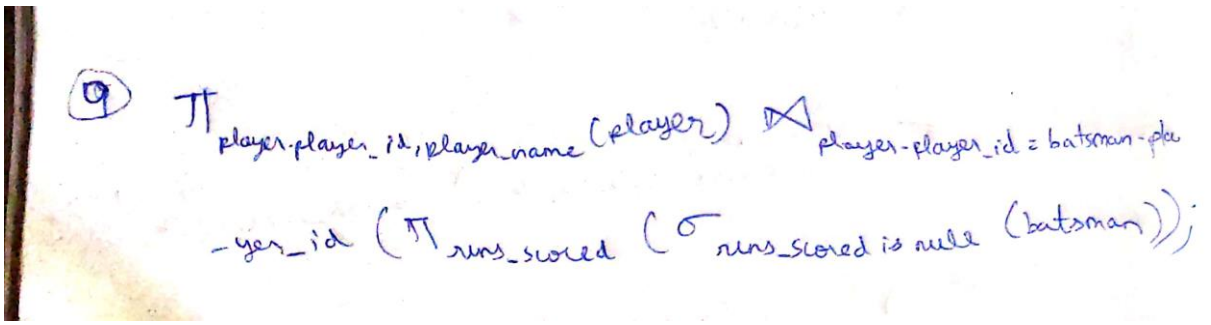
```
SQL> select player_name,no_of_wickets from bowler,player where player.player_id=bowler.player_id and exists(select * from bowler where no_of_wickets>100);

PLAYER_NAME          NO_OF_WICKETS
-------------------- -------------
Sam Curran                      45
Bravo                          153
Chahar                          23
Thakur                          46
Chawla                         156
Tahir                           80
Hardik Pandya                   42
Kieron Pollard                  60
Jasprit Bumrah                 109
Trent Boult                     63
Dhawal Kulkarni                 86
Mitchell Mcclenaghan            71
Krunal Pandya                   46
Washington Sundar               24
Yuzvendra Chahal               121
Dale Steyn                      97
Umesh Yadav                    119
Mohammad Siraj                  39
Chirs Morris                    80
Mohammad Nabi                   11
Vijay Shankar                    6
Jason Holder                    19
Rashid Khan                     75
Shahbaaz Nadeem                 47
Siddharth Kaul                  51
Glenn Maxwell                   19
Mohammad Shami                  60
Chris Jordan                    21
Sheldon Cottrell                 6
Krishnappa Gowtham              13
Ben Stokes                      28
Rahul Tewatia                   24
Jofra Archer                    46
Varun Aaron                     42
Jaydev Unadkat                  81
Ankit Rajpoot                   24
Marcus Stoinis                  28
Axar Patel                      80
Ravichandran Ashwin            138
Kagiso Rabada                   61
Anrich Nortje                   22
Andre Russell                   61
Sunil Narine                   127
Kuldeep Yadav                   40
Varun Chakravarthy              18
Lockie Ferguson                 11
Pat Cummins                     29

47 rows selected.
```

8. Not exists

```
SQL> select * from sponsors where not exists(select * from sponsors where shirt_sponsor_front='Muthoot Group');

no rows selected

SQL>
```

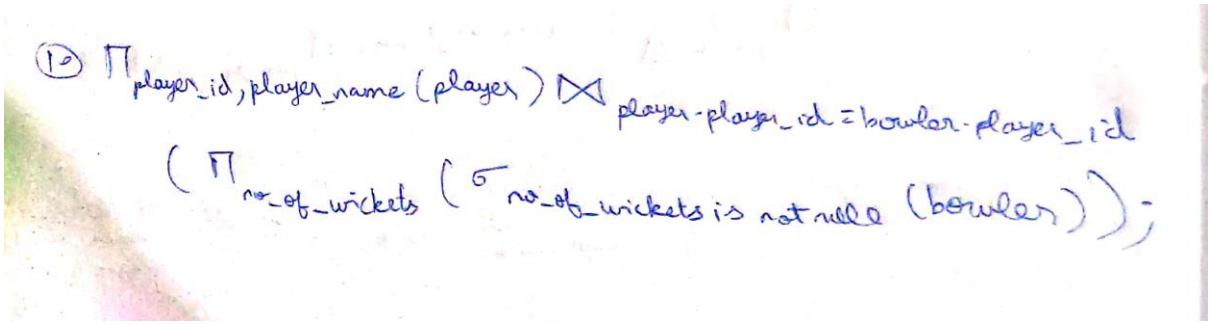
9. Is null

```
SQL> update batsman set runs_scored=null where player_id in (46,21,30,53);

4 rows updated.

SQL> select player.player_id,player_name,runs_scored from player,batsman where player.player_id=batsman.player_id and runs_scored is null;

 PLAYER_ID PLAYER_NAME          RUNS_SCORED
---------- -------------------- -----------
        21 Trent Boult
        30 Yuzvendra Chahal
        46 Siddharth Kaul
        53 Chris Jordan

SQL>
```



10. Is not null

```
SQL> select player.player_id,player_name,no_of_wickets from player,bowler where player.player_id=bowler.player_id and no_of_wickets is not null;

 PLAYER_ID PLAYER_NAME          NO_OF_WICKETS
---------- -------------------- -------------
         6 Sam Curran                      45
         8 Bravo                          153
         9 Chahar                          23
        10 Thakur                          46
        11 Chawla                         156
        12 Tahir                           80
        14 Hardik Pandya                   42
        16 Kieron Pollard                  60
        17 Jasprit Bumrah                 109
        21 Trent Boult                     63
        22 Dhawal Kulkarni                 86
        23 Mitchell Mcclenaghan            71
        24 Krunal Pandya                   46
        29 Washington Sundar               24
        30 Yuzvendra Chahal               121
        32 Dale Steyn                      97
        33 Umesh Yadav                    119
        34 Mohammad Siraj                  39
        35 Chirs Morris                    80
        39 Mohammad Nabi                   11
        41 Jason Holder                    19
        44 Rashid Khan                     75
        45 Shahbaaz Nadeem                 47
        46 Siddharth Kaul                  51
        49 Glenn Maxwell                   19
        52 Mohammad Shami                  60
        53 Chris Jordan                    21
        55 Krishnappa Gowtham              13
        58 Ben Stokes                      28
        60 Rahul Tewatia                   24
        64 Jofra Archer                    46
        65 Varun Aaron                     42
        66 Jaydev Unadkat                  81
        67 Ankit Rajpoot                   24
        73 Marcus Stoinis                  28
        74 Axar Patel                      80
        75 Ravichandran Ashwin            138
        76 Kagiso Rabada                   61
        77 Anrich Nortje                   22
        81 Andre Russell                   61
        82 Sunil Narine                   127
        83 Kuldeep Yadav                   40
        84 Varun Chakravarthy              18
        85 Lockie Ferguson                 11
        86 Pat Cummins                     29

45 rows selected.
```

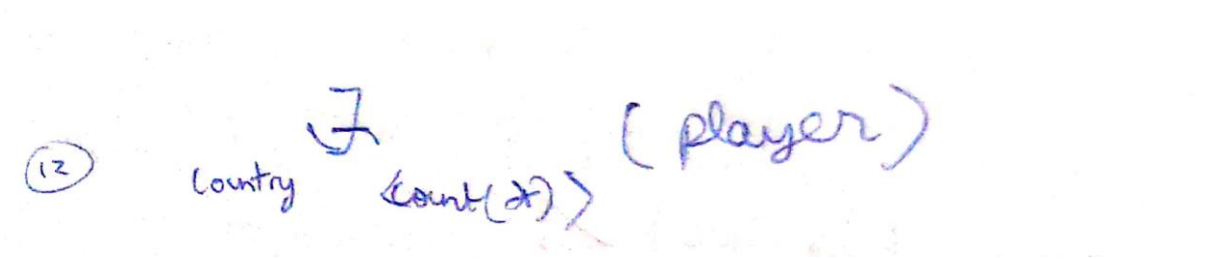


11. Select distinct

```
SQL> select count(distinct country) from player;

COUNT(DISTINCTCOUNTRY)
----------------------
                    11

SQL>
```

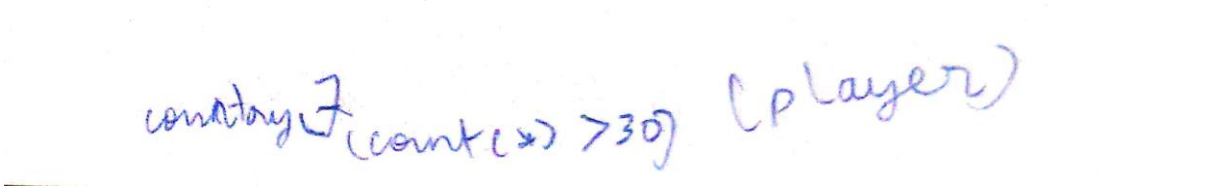
12. Group by

```
SQL> select count(*),country from player group by country;

  COUNT(*) COUNTRY
---------- --------------------------------
         8 AUS
         5 NZ
         2 AFG
         6 WI
         4 ENG
         1 IRE
         1 BAR
        50 IND
         7 RSA
         1 UK
         1 TNT

11 rows selected.
```



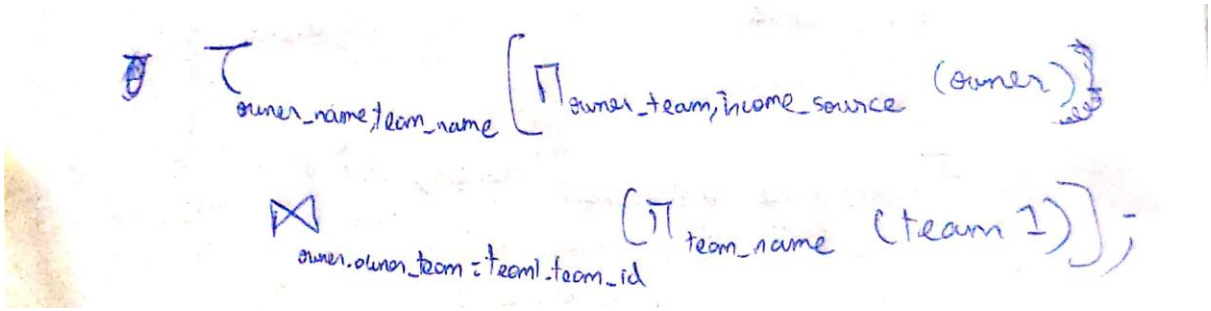
13. Group by having

```
SQL> select count(*),country from player group by country having count(*)>30;

  COUNT(*) COUNTRY
---------- --------------------------------
        50 IND

SQL>
```



14. Order by

```
SQL> select owner_name,income_source,team_name from owner,team1 where owner.owner_team=team1.team_id order by owner_name,team_name;

OWNER_NAME                     INCOME_SOURCE                  TEAM_NAME
------------------------------ ------------------------------ ------------------------------
GMR Group                      infrastructure sector          Delhi Capitals
India Cements                  cement industry                Chennai Super Kings
JSW Group                      business conglomerate          Delhi Capitals
Manoj Badale                   businessman                    Rajasthan Royals
Mehta Group                    business conglomerate          Kolkata Knight Riders
Mohit Burman                   businessman                    Kings XI Punjab
Ness Wadia                     businessman                    Kings XI Punjab
Preity Zinta                   film actor                     Kings XI Punjab
Red Chillies Entertainment     film distribution              Kolkata Knight Riders
Reliance Industries            telecommunications             Mumbai Indians
Sun TV Network                 media network                  Sunrisers Hyderabad
United Spirits                 alcoholic beverages            Royal Challengers Bangalore

12 rows selected.
```

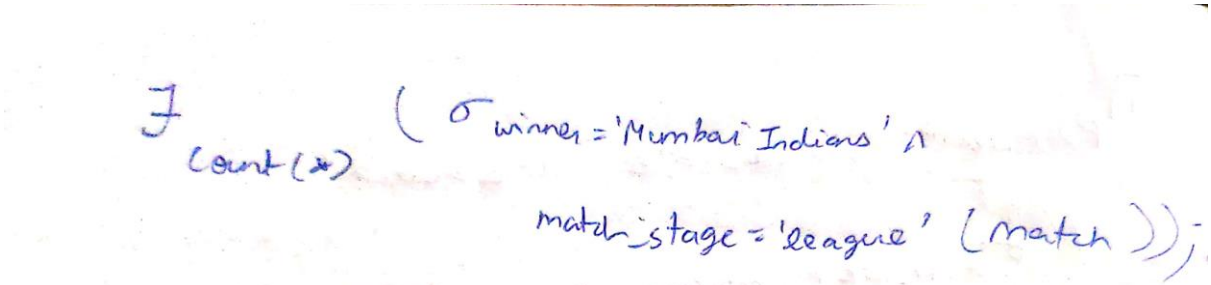


15. Order by desc

```
SQL> select owner_name,income_source,team_name from owner,team1 where owner.owner_team=team1.team_id order by team_name desc;

OWNER_NAME                     INCOME_SOURCE                  TEAM_NAME
------------------------------ ------------------------------ ------------------------------
Sun TV Network                 media network                  Sunrisers Hyderabad
United Spirits                 alcoholic beverages            Royal Challengers Bangalore
Manoj Badale                   businessman                    Rajasthan Royals
Reliance Industries            telecommunications             Mumbai Indians
Red Chillies Entertainment     film distribution              Kolkata Knight Riders
Mehta Group                    business conglomerate          Kolkata Knight Riders
Preity Zinta                   film actor                     Kings XI Punjab
Ness Wadia                     businessman                    Kings XI Punjab
Mohit Burman                   businessman                    Kings XI Punjab
JSW Group                      business conglomerate          Delhi Capitals
GMR Group                      infrastructure sector          Delhi Capitals
India Cements                  cement industry                Chennai Super Kings

12 rows selected.
```

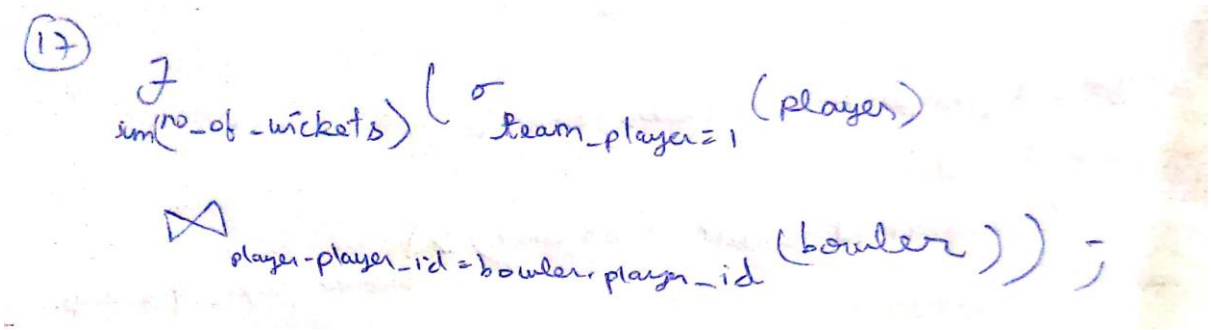
16. Count

```
SQL> select count(*) from match where winner='Mumbai Indians' and match_stage='league';

  COUNT(*)
----------
         3

SQL>
```



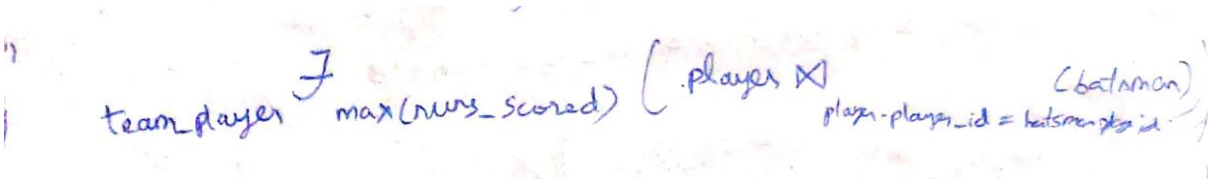
17. Sum

```
SQL> select sum(no_of_wickets) from player,bowler where player.player_id=bowler.player_id and player.team_player=1;

SUM(NO_OF_WICKETS)
------------------
               503

SQL>
```



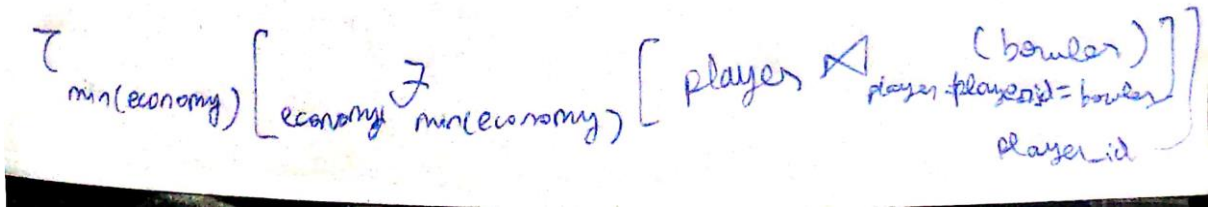
18. Max

```
SQL> select max(runs_scored),team_player from player,batsman where player.player_id=batsman.player_id group by team_player;

MAX(RUNS_SCORED) TEAM_PLAYER
---------------- -----------
            4632           1
            4607           6
            5280           2
            5254           4
            4772           5
            3823           8
            5878           3
            5197           7

8 rows selected.
```



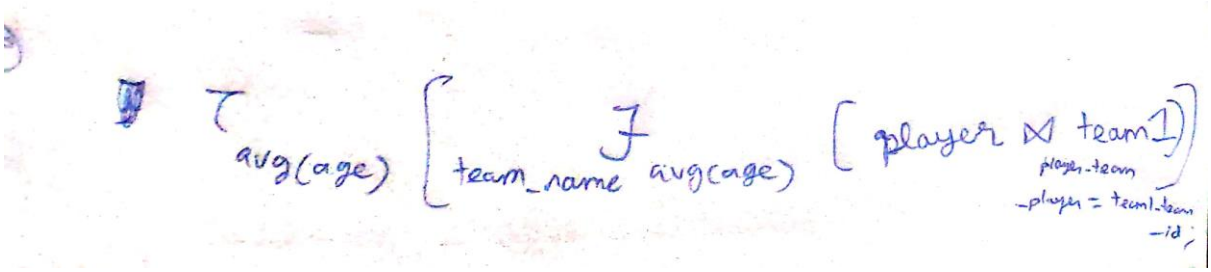
19. Min

```
SQL> select min(economy),team_player from player,bowler where player.player_id=bowler.player_id group by team_player order by min(economy);

MIN(ECONOMY) TEAM_PLAYER
------------ -----------
        6.24           4
        6.77           8
        6.87           7
        6.87           3
        7.13           6
        7.26           2
        7.62           1
        8.26           5

8 rows selected.
```



20. Avg

```
SQL> select avg(age),team_name from player,team1 where player.team_player=team1.team_id group by team_name order by avg(age);

  AVG(AGE) TEAM_NAME
---------- ------------------------------
      27.7 Delhi Capitals
29.0909091 Rajasthan Royals
29.4166667 Mumbai Indians
      29.9 Kings XI Punjab
30.1111111 Kolkata Knight Riders
30.4545455 Royal Challengers Bangalore
30.7272727 Sunrisers Hyderabad
33.0833333 Chennai Super Kings

8 rows selected.
```



21. Nested subquery

```
SQL> select owner_id,owner_name,income_source,budget from owner where budget=(select max(budget) from owner);

  OWNER_ID OWNER_NAME                     INCOME_SOURCE                  BUDGET
---------- ------------------------------ ------------------------------ ---------------
         1 India Cements                  cement industry                84.85 crores

SQL>
```

22. Subquery with any

```
SQL> select owner_id,owner_name,income_source,budget from owner where budget>any(select budget from owner where budget>'75 crores');

  OWNER_ID OWNER_NAME                     INCOME_SOURCE                 BUDGET
---------- ------------------------------ ------------------------------ ---------------
         1 India Cements                  cement industry               84.85 crores
         2 Reliance Industries            telecommunications            83.05 crores
         3 United Spirits                 alcoholic beverages           78.60 crores
         9 Red Chillies Entertainment     film distribution             76.50 crores
        10 Mehta Group                    business conglomerate         76.50 crores

SQL>
```

23. Subquery with all

```
SQL> select owner_id,owner_name,income_source,budget from owner where budget>=all(select min(budget) from owner);

  OWNER_ID OWNER_NAME                     INCOME_SOURCE                 BUDGET
---------- ------------------------------ ------------------------------ ---------------
         1 India Cements                  cement industry               84.85 crores
        11 Ness Wadia                     businessman                   68.50 crores
        12 Preity Zinta                   film actor                    68.50 crores
         2 Reliance Industries            telecommunications            83.05 crores
         3 United Spirits                 alcoholic beverages           78.60 crores
         4 Sun TV Network                 media network                 74.90 crores
         5 Mohit Burman                   businessman                   68.50 crores
         6 Manoj Badale                   businessman                   70.25 crores
         7 GMR Group                      infrastructure sector         76.00 crores
         8 JSW Group                      business conglomerate         76.00 crores
         9 Red Chillies Entertainment     film distribution             76.50 crores
        10 Mehta Group                    business conglomerate         76.50 crores

12 rows selected.

SQL>
```

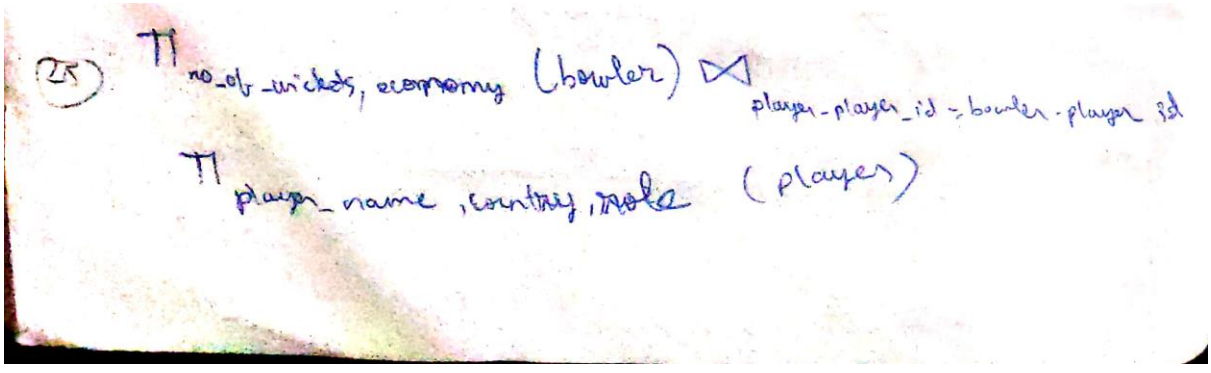
24. Self join

```
SQL> select (v1.venue_name || ' is bigger than ' || v2.venue_name) comparison from venue v1 inner join venue v2 on v1.capacity>v2.capacity order by v2.capacity;

COMPARISON
--------------------------------------------------------------------------------
Chinnaswamy Stadium is bigger than PCA Stadium
Wankhede Stadium is bigger than PCA Stadium
Arun Jaitley Stadium is bigger than PCA Stadium
Chidambaram Stadium is bigger than PCA Stadium
Rajiv Gandhi Stadium is bigger than PCA Stadium
Eden Gardens is bigger than PCA Stadium
Chinnaswamy Stadium is bigger than Sawai Mansingh Stadium
Wankhede Stadium is bigger than Sawai Mansingh Stadium
Arun Jaitley Stadium is bigger than Sawai Mansingh Stadium
Chidambaram Stadium is bigger than Sawai Mansingh Stadium
Rajiv Gandhi Stadium is bigger than Sawai Mansingh Stadium
Eden Gardens is bigger than Sawai Mansingh Stadium
Wankhede Stadium is bigger than Chinnaswamy Stadium
Arun Jaitley Stadium is bigger than Chinnaswamy Stadium
Chidambaram Stadium is bigger than Chinnaswamy Stadium
Rajiv Gandhi Stadium is bigger than Chinnaswamy Stadium
Eden Gardens is bigger than Chinnaswamy Stadium
Arun Jaitley Stadium is bigger than Wankhede Stadium
Chidambaram Stadium is bigger than Wankhede Stadium
Rajiv Gandhi Stadium is bigger than Wankhede Stadium
Eden Gardens is bigger than Wankhede Stadium
Chidambaram Stadium is bigger than Arun Jaitley Stadium
Rajiv Gandhi Stadium is bigger than Arun Jaitley Stadium
Eden Gardens is bigger than Arun Jaitley Stadium
Rajiv Gandhi Stadium is bigger than Chidambaram Stadium
Eden Gardens is bigger than Chidambaram Stadium
Eden Gardens is bigger than Rajiv Gandhi Stadium

27 rows selected.

SQL>
```

25. Inner join

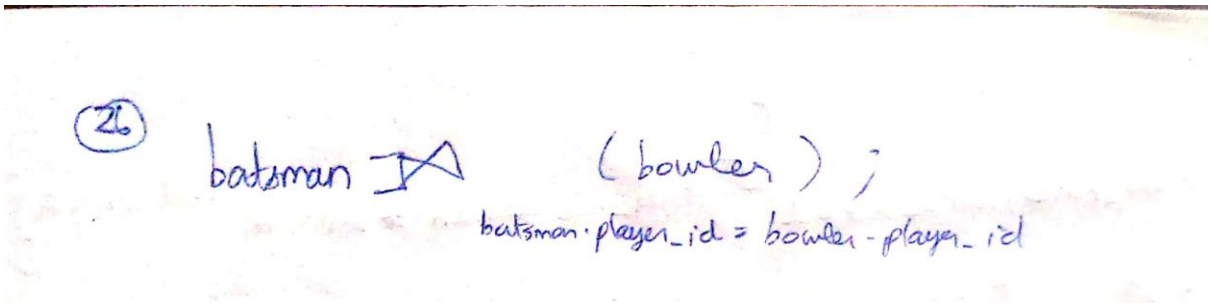
```
SQL> select player_name,country,role,no_of_wickets,economy from player join bowler on player.player_id=bowler.player_id;

PLAYER_NAME          COUNTRY                        ROLE                NO_OF_WICKETS    ECONOMY
-------------------- ------------------------------ ------------------- ------------- ----------
Sam Curran           UK                             bat/bowl                       45       7.62
Bravo                WI                             bat/bowl                      153        8.4
Chahar               IND                            bat/bowl                       23       8.89
Thakur               IND                            bat/bowl                       46       8.92
Chawla               IND                            bat/bowl                      156       7.87
Tahir                RSA                            bat/bowl                       80       7.83
Hardik Pandya        IND                            bat                            42       9.06
Kieron Pollard       IND                            bat/bowl                       60       8.87
Jasprit Bumrah       IND                            bat/bowl                      109       7.41
Trent Boult          NZ                             bat/bowl                       63       8.53
Dhawal Kulkarni      IND                            bat/bowl                       86       8.25
Mitchell Mcclenaghan NZ                             bat/bowl                       71       8.49
Krunal Pandya        IND                            bat/bowl                       46       7.26
Washington Sundar    IND                            bat                            24       6.87
Yuzvendra Chahal     IND                            bat/bowl                      121       7.67
Dale Steyn           RSA                            bat/bowl                       97       6.91
Umesh Yadav          IND                            bat/bowl                      119       8.51
Mohammad Siraj       IND                            bat/bowl                       39       9.08
Chirs Morris         RSA                            bat/bowl                       80       7.81
Mohammad Nabi        AFG                            bat/bowl                       11       6.54
Vijay Shankar        IND                            bat/bowl                        6       8.42
Jason Holder         WI                             bat/bowl                       19       8.42
Rashid Khan          AFG                            bat/bowl                       75       6.24
Shahbaaz Nadeem      IND                            bat/bowl                       47       7.53
Siddharth Kaul       IND                            bat/bowl                       51       8.65
Glenn Maxwell        AUS                            bat/bowl                       19       8.57
Mohammad Shami       IND                            bat                            60       8.89
Chris Jordan         BAR                            bat/bowl                       21       9.33
Sheldon Cottrell     WI                             bat/bowl                        6        8.8
Krishnappa Gowtham   IND                            bat/bowl                       13       8.26
Ben Stokes           ENG                            bat/bowl                       28       8.52
Rahul Tewatia        IND                            bat                            24       7.13
Jofra Archer         ENG                            bat/bowl                       46       7.13
Varun Aaron          IND                            bat/bowl                       42       8.89
Jaydev Unadkat       IND                            bat/bowl                       81       8.83
Ankit Rajpoot        IND                            bat/bowl                       24       9.23
Marcus Stoinis       AUS                            bat/bowl                       28       9.37
Axar Patel           IND                            bat/bowl                       80       7.29
Ravichandran Ashwin  IND                            bat/bowl                      138       6.87
Kagiso Rabada        IND                            bat/bowl                       61       8.23
Anrich Nortje        RSA                            bat/bowl                       22       8.39
Andre Russell        WI                             bat/bowl                       61       8.96
Sunil Narine         WI                             bat/bowl                      127       6.77
Kuldeep Yadav        IND                            bat/bowl                       40       8.27
Varun Chakravarthy   IND                            bat/bowl                       18        7.1
Lockie Ferguson      NZ                             bat/bowl                       11        8.5
Pat Cummins          AUS                            bat/bowl                       29          8

47 rows selected.
```

```
SQL> select player_name, runs_scored,no_of_wickets from batsman join player on batsman.player_id=player.player_id join bowler on bowler. player_id=player.player_id;

PLAYER_NAME          RUNS_SCORED NO_OF_WICKETS
-------------------- ----------- -------------
Sam Curran                   281            45
Bravo                       1490           153
Chahar                      1271            23
Thakur                      1340            46
Chawla                      4263           156
Tahir                       1687            80
Hardik Pandya               1349            42
Kieron Pollard              3023            60
Jasprit Bumrah                40           109
Trent Boult                   12            63
Dhawal Kulkarni              104            86
Mitchell Mcclenaghan          85            71
Krunal Pandya               1000            46
Washington Sundar            186            24
Yuzvendra Chahal              22           121
Dale Steyn                   167            97
Umesh Yadav                  122           119
Mohammad Siraj                46            39
Chirs Morris                 551            80
Mohammad Nabi                146            11
Vijay Shankar                654             6
Jason Holder                 104            19
Rashid Khan                  139            75
Shahbaaz Nadeem               39            47
Siddharth Kaul                12            51
Glenn Maxwell               1505            19
Mohammad Shami                56            60
Chris Jordan                  32            21
Krishnappa Gowtham           186            13
Ben Stokes                   920            28
Rahul Tewatia                366            24
Jofra Archer                 195            46
Varun Aaron                   50            42
Jaydev Unadkat                64            81
Marcus Stoinis               825            28
Axar Patel                   913            80
Ravichandran Ashwin          412           138
Kagiso Rabada                125            61
Andre Russell               1517            61
Sunil Narine                 892           127
Pat Cummins                  223            29

41 rows selected.
```



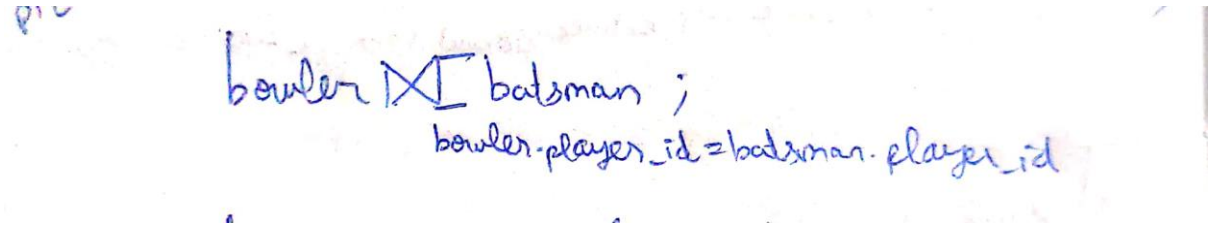
26. Left join

```
SQL> select * from batsman left join bowler on batsman.player_id=bowler.player_id where rownum<=20;

 PLAYER_ID RUNS_SCORED STRIKE_RATE BATTING_AVG  PLAYER_ID NO_OF_WICKETS OVERS_BOWLED    ECONOMY BOWLER_TYPE
---------- ---------- ----------- ----------- ---------- ------------ ------------ ---------- --------------------
         1       4632       136.4          41
         2       2302       129.2        32.9
         3       3874       137.9          31
         4        204       120.7          51
         5       3659       126.1        29.5
         6        281       143.4        23.4          6           45          400       7.62 28.2
         7       1141       124.2        22.8
         8       1490       128.2        22.6          8          153         2700        8.4 24.81
         9       1271        22.2        28.2          9           23          450        8.89 29
        10       1340        19.6        29.1         10           46          500        8.92 29.1
        11       4263        20.8        27.3         11          156         3000        7.87 27.3
        12       1687        16.1        21.1         12           80         1650        7.83 21.1
        13       5280       130.6        31.3
        14       1349       159.3          30         14           42          400        9.06 31.3
        15       1211       136.8        28.8
        16       3023       149.9        29.9         16           60          905        8.87 32.7
        17         40        97.6        13.7         17          109         1500        7.41 23.7
        18       1959       133.5        31.6
        19       1280       140.5        33.7
        20       2024       134.6        30.2

20 rows selected.
```



27. Right join

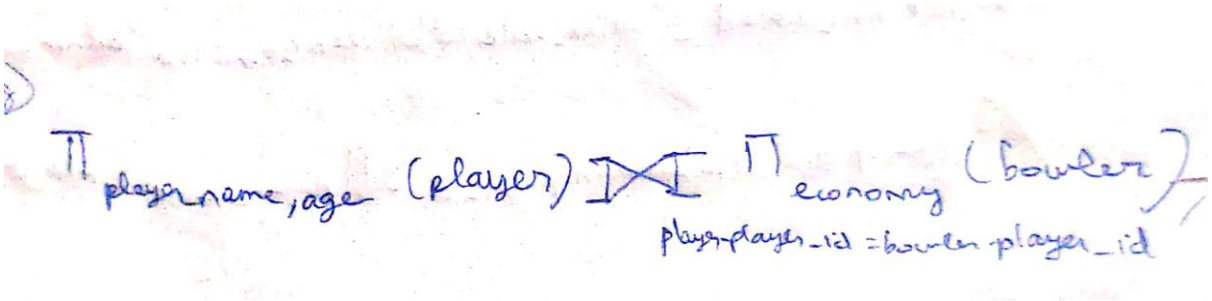
```
SQL> select * from bowler right join batsman on batsman.player_id=bowler.player_id where rownum<=20;

 PLAYER_ID NO_OF_WICKETS OVERS_BOWLED    ECONOMY BOWLER_TYPE          PLAYER_ID RUNS_SCORED STRIKE_RATE BATTING_AVG
---------- ------------- ------------ ---------- -------------------- ---------- ---------- ----------- -----------
                                                                            1       4632       136.4          41
                                                                            2       2302       129.2        32.9
                                                                            3       3874       137.9          31
                                                                            4        204       120.7          51
                                                                            5       3659       126.1        29.5
         6            45          400       7.62 28.2                     6        281       143.4        23.4
                                                                            7       1141       124.2        22.8
         8           153         2700        8.4 24.81                    8       1490       128.2        22.6
         9            23          450       8.89 29                       9       1271        22.2        28.2
        10            46          500       8.92 29.1                    10       1340        19.6        29.1
        11           156         3000       7.87 27.3                    11       4263        20.8        27.3
        12            80         1650       7.83 21.1                    12       1687        16.1        21.1
                                                                           13       5280       130.6        31.3
        14            42          400       9.06 31.3                    14       1349       159.3          30
                                                                           15       1211       136.8        28.8
        16            60          905       8.87 32.7                    16       3023       149.9        29.9
        17           109         1500       7.41 23.7                    17         40        97.6        13.7
                                                                           18       1959       133.5        31.6
                                                                           19       1280       140.5        33.7
                                                                           20       2024       134.6        30.2

20 rows selected.
```



28. Full join

```
SQL> select player_name,age,economy from player full join bowler on player.player_id=bowler.player_id;

PLAYER_NAME                AGE    ECONOMY
-------------------- ---------- ----------
MS Dhoni                   39
FAF du Plessis             36
Shane Watson               39
Ruturaj Gaikwad            23
Ambati Rayudu              35
Sam Curran                 22       7.62
Jadhav                     35
Bravo                      39        8.4
Chahar                     28       8.89
Thakur                     29       8.92
Chawla                     31       7.87
Tahir                      41       7.83
Rohit Sharma               33
Hardik Pandya              27       9.06
Ishan Kishan               22
Kieron Pollard             33       8.87
Jasprit Bumrah             26       7.41
Quintin De Kock            27
Chris Lynn                 30
Suryakumar Yadav           30
Trent Boult                31       8.53
Dhawal Kulkarni            31       8.25
Mitchell Mcclenaghan       34       8.49
Krunal Pandya              29       7.26
Virat Kohli                31
AB De Villiers             36
Devdutt Padikkal           20
Aaron Finch                33
Washington Sundar          21       6.87
Yuzvendra Chahal           30       7.67
Parthiv Patel              35
Dale Steyn                 37       6.91
Umesh Yadav                33       8.51
Mohammad Siraj             26       9.08
Chirs Morris               33       7.81
David Warner               34
Manish Pandey              31
Kane Williamson            30
Mohammad Nabi              35       6.54
Vijay Shankar              29       8.42
Jason Holder               29       8.42
Wriddhiman Saha            36
Jonny Bairstow             31
Rashid Khan                22       6.24
Shahbaaz Nadeem            31       7.53
Siddharth Kaul             30       8.65
Chris Gayle                41
KL Rahul                   28
Glenn Maxwell              32       8.57
```

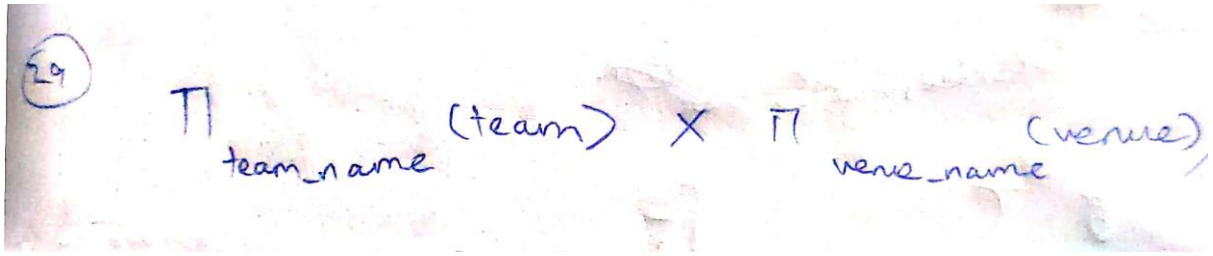
```
Glenn Maxwell                 32        8.57
James Neesham                 30
Nicolas Pooran                25
Mohammad Shami                20        8.89
Chris Jordan                  32        9.33
Sheldon Cottrell              31         8.8
Krishnappa Gowtham            32        8.26
Karun Nair                    28
Steve Smith                   31
Ben Stokes                    29        8.52
David Miller                  31
Rahul Tewatia                 27        7.13
Robin Uthappa                 35
Sanju Samson                  26
Jos Buttler                   30
Jofra Archer                  25        7.13
Varun Aaron                   31        8.89
Jaydev Unadkat                29        8.83
Ankit Rajpoot                 26        9.23
Shreyas Iyer                  25
Shikhar Dhawan                34
Ajinkya Rahane                32
Prithvi Shaw                  21
Rishabh Pant                  23
Marcus Stoinis                31        9.37
Axar Patel                    26        7.29
Ravichandran Ashwin           34        6.87
Kagiso Rabada                 25        8.23
Anrich Nortje                 26        8.39
Dinesh Karthik                35
Eoin Morgan                   36
Nitish Rana                   26
Andre Russell                 32        8.96
Sunil Narine                  32        6.77
Kuldeep Yadav                 25        8.27
Varun Chakravarthy            29         7.1
Lockie Ferguson               29         8.5
Pat Cummins                   27           8

86 rows selected.

SQL>
```



29. Cross join

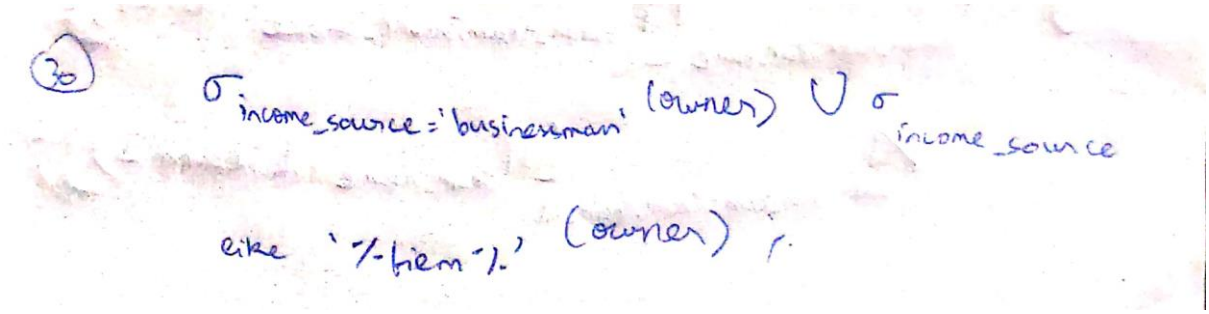
```
SQL> select team_name,venue_name from team1 cross join venue;

TEAM_NAME                      VENUE_NAME
------------------------------ ------------------------------
Chennai Super Kings            Chidambaram Stadium
Chennai Super Kings            Wankhede Stadium
Chennai Super Kings            Chinnaswamy Stadium
Chennai Super Kings            Rajiv Gandhi Stadium
Chennai Super Kings            PCA Stadium
Chennai Super Kings            Sawai Mansingh Stadium
Chennai Super Kings            Arun Jaitley Stadium
Chennai Super Kings            Eden Gardens
Delhi Capitals                 Chidambaram Stadium
Delhi Capitals                 Wankhede Stadium
Delhi Capitals                 Chinnaswamy Stadium
Delhi Capitals                 Rajiv Gandhi Stadium
Delhi Capitals                 PCA Stadium
Delhi Capitals                 Sawai Mansingh Stadium
Delhi Capitals                 Arun Jaitley Stadium
Delhi Capitals                 Eden Gardens
Kings XI Punjab                Chidambaram Stadium
Kings XI Punjab                Wankhede Stadium
Kings XI Punjab                Chinnaswamy Stadium
Kings XI Punjab                Rajiv Gandhi Stadium
Kings XI Punjab                PCA Stadium
Kings XI Punjab                Sawai Mansingh Stadium
Kings XI Punjab                Arun Jaitley Stadium
Kings XI Punjab                Eden Gardens
Kolkata Knight Riders          Chidambaram Stadium
Kolkata Knight Riders          Wankhede Stadium
Kolkata Knight Riders          Chinnaswamy Stadium
Kolkata Knight Riders          Rajiv Gandhi Stadium
Kolkata Knight Riders          PCA Stadium
Kolkata Knight Riders          Sawai Mansingh Stadium
Kolkata Knight Riders          Arun Jaitley Stadium
Kolkata Knight Riders          Eden Gardens
Mumbai Indians                 Chidambaram Stadium
Mumbai Indians                 Wankhede Stadium
Mumbai Indians                 Chinnaswamy Stadium
Mumbai Indians                 Rajiv Gandhi Stadium
Mumbai Indians                 PCA Stadium
Mumbai Indians                 Sawai Mansingh Stadium
Mumbai Indians                 Arun Jaitley Stadium
Mumbai Indians                 Eden Gardens
Rajasthan Royals               Chidambaram Stadium
Rajasthan Royals               Wankhede Stadium
Rajasthan Royals               Chinnaswamy Stadium
Rajasthan Royals               Rajiv Gandhi Stadium
Rajasthan Royals               PCA Stadium
Rajasthan Royals               Sawai Mansingh Stadium
Rajasthan Royals               Arun Jaitley Stadium
Rajasthan Royals               Eden Gardens
Royal Challengers Bangalore    Chidambaram Stadium
Royal Challengers Bangalore    Wankhede Stadium
```

```
Royal Challengers Bangalore     Chidambaram Stadium
Royal Challengers Bangalore     Wankhede Stadium
Royal Challengers Bangalore     Chinnaswamy Stadium
Royal Challengers Bangalore     Rajiv Gandhi Stadium
Royal Challengers Bangalore     PCA Stadium
Royal Challengers Bangalore     Sawai Mansingh Stadium
Royal Challengers Bangalore     Arun Jaitley Stadium
Royal Challengers Bangalore     Eden Gardens
Sunrisers Hyderabad             Chidambaram Stadium
Sunrisers Hyderabad             Wankhede Stadium
Sunrisers Hyderabad             Chinnaswamy Stadium
Sunrisers Hyderabad             Rajiv Gandhi Stadium
Sunrisers Hyderabad             PCA Stadium
Sunrisers Hyderabad             Sawai Mansingh Stadium
Sunrisers Hyderabad             Arun Jaitley Stadium
Sunrisers Hyderabad             Eden Gardens

64 rows selected.
```



30. Union

```
SQL> select * from owner where income_source='businessman' union select * from owner where income_source like '%film%';

  OWNER_ID OWNER_NAME                    INCOME_SOURCE                 OWNER_TEAM
---------- ------------------------------ ------------------------------ ----------
         5 Mohit Burman                   businessman                             5
         6 Manoj Badale                   businessman                             6
         9 Red Chillies Entertainment     film distribution                       8
        11 Ness Wadia                     businessman                             5
        12 Preity Zinta                   film actor                              5

SQL>
```



31. Intersection

```
SQL> select * from owner where owner_name like '%Group%' intersect select * from owner where owner_team=7;

  OWNER_ID OWNER_NAME                    INCOME_SOURCE                 OWNER_TEAM
---------- ------------------------------ ------------------------------ ----------
         7 GMR Group                      infrastructure sector                   7
         8 JSW Group                      business conglomerate                   7
```

31) $\sigma_{owner\_name\ like\ '\%Group\%'}(owner) \cap \sigma_{owner\_team=7}(owner)$

32. Difference

```
SQL> select player_id from batsman minus select player_id from bowler;

 PLAYER_ID
----------
         1
         2
         3
         4
         5
         7
        13
        15
        18
        19
        20
        25
        26
        27
        28
        31
        36
        37
        38
        42
        43
        47
        48
        50
        51
        56
        57
        59
        61
        62
        63
        68
        69
        70
        71
        72
        78
        79
        80

39 rows selected.
```

32) $\Pi_{player\_id}(batsman) - \Pi_{player\_id}(bowler)$

33. Create view

```
SQL> create view view1 as select 2*count(winner) as points,winner as team_name from match group by winner order by points desc;
View created.
SQL>
```

34. Display view

```
SQL> select * from view1;

    POINTS TEAM_NAME
---------- ------------------------------
        12 Mumbai Indians
        10 Delhi Capitals
         6 Kolkata Knight Riders
         6 Sunrisers Hyderabad
         4 Royal Challengers Bangalore
         4 Chennai Super Kings
         4 Rajasthan Royals
         2 Kings XI Punjab

8 rows selected.
```

35. Force view

```
SQL> create force view view2 as select points,team_name,run_rate from view1;

Warning: View created with compilation errors.

SQL>
```

36. Displaying force view

```
SQL> select * from view2;
select * from view2
              *
ERROR at line 1:
ORA-04063: view "SYSTEM.VIEW2" has errors
```

37. Dropping the view

```
SQL> drop view view2;

View dropped.
```

5. PL/SQL

i) Creating a trigger ‘played’ that increments the value of played matches of a team in the points table when it is encountered in the match table record

```
SQL> create or replace trigger played
  2     after
  3     insert
  4     on match
  5     for each row
  6     declare
  7        cursor cc1 is select * from points_table;
  8     begin
  9        for i in cc1
 10        loop
 11                if(:new.winner = i.team_name) or (:new.loser = i.team_name) then
 12                        update points_table set played=played+1 where team_name=i.team_name;
 13                end if;
 14        end loop;
 15     end;
 16     /

Trigger created.
```

```
SQL> insert into match values(1,'Chennai Super Kings','Mumbai Indians','league','19-SEP-20',4,0.8);

1 row created.

SQL>
```

Inserting 24 rows in total… because 24 matches are played in the tournament

```
SQL> select * from points_table order by played desc;

   TEAM_ID TEAM_NAME                       PLAYED        WON       LOST     POINTS        NRR
---------- ------------------------------ ---------- ---------- ---------- ---------- ----------
         2 Mumbai Indians                          8          0          0          0          0
         7 Delhi Capitals                          7          0          0          0          0
         8 Kolkata Knight Riders                   7          0          0          0          0
         4 Sunrisers Hyderabad                     6          0          0          0          0
         5 Kings XI Punjab                         5          0          0          0          0
         6 Rajasthan Royals                        5          0          0          0          0
         1 Chennai Super Kings                     5          0          0          0          0
         3 Royal Challengers Bangalore             5          0          0          0          0

8 rows selected.
```

- **Creating a procedure to calculate the points of a team in the points_table**

- It increases the points of winning team by 2 for each match
- It increases the number of matches won by 1 for winning team
- Increases number of matches lost by 1 for losing team for each lost match
- Calculates the net run rate of each team to be used as a ‘tie breaker’ in case two points have same amount of points

```
SQL> create or replace procedure calc_points
  2     is
  3     a varchar(100);
  4     b varchar(100);
  5     c float;
  6     d float;
  7     k float;
  8     cursor cc is select * from match;
  9     cursor tt is select * from points_table;
 10     begin
 11        for i in cc
 12        loop
 13                a:=i.winner;
 14                b:=i.loser;
 15                c:=i.run_diff;
 16                d:=i.over_diff;
 17                k:= (c+d)/100.0;
 18                for j in tt
 19                loop
 20                        if(j.team_name = a) then
 21        update points_table set won=won+1 where team_name = j.team_name;
 22                                update points_table set points=points+2 where team_name = j.team_name;
 23                update points_table set nrr=nrr+k where team_name = j.team_name;
 24
 25                        end if;
 26                        if(j.team_name = b) then
 27                                update points_table set lost=lost+1 where team_name = j.team_name;
 28        update points_table set nrr=nrr-k where team_name = j.team_name;
 29                        end if;
 30                end loop;
 31        end loop;
 32     end;
 33     /

Procedure created.
```

Executing the procedure now…

```
SQL> execute calc_points;

PL/SQL procedure successfully completed.
```

```
SQL> select * from points_table order by points desc,nrr desc;

   TEAM_ID TEAM_NAME                       PLAYED        WON       LOST     POINTS        NRR
---------- ------------------------------ ---------- ---------- ---------- ---------- ----------
         2 Mumbai Indians                          8          6          2         12       1.47
         7 Delhi Capitals                          7          5          2         10      1.608
         4 Sunrisers Hyderabad                     6          3          3          6       -.08
         8 Kolkata Knight Riders                   7          3          4          6       -.405
         1 Chennai Super Kings                     5          2          3          4       -.57
         6 Rajasthan Royals                        5          2          3          4       -.807
         3 Royal Challengers Bangalore             5          2          3          4     -1.707
         5 Kings XI Punjab                         5          1          4          2       .491

8 rows selected.
```

Thus, the points and run rate of each team is calculated and displayed in points table.

- Creating a function to return the team in first place in the points table.

```
SQL> create or replace function first_place
  2  return varchar
  3  is
  4  a varchar(100);
  5  begin
  6     select team_name into a from points_table where rownum=1 order by points desc;
  7     return ('the first place team is '||a);
  8  end;
  9  /

Function created.
```

8. Normalisation

Entities are team1, owner, points_table, sponsors, venue, player, batsman, bowler, match

1. **Team1**

```
SQL> select * from team1;

   TEAM_ID TEAM_NAME                      CITY                 CEO                            CAPTAIN                        HEAD_COACH
---------- ------------------------------ -------------------- ------------------------------ ------------------------------ ------------------------------
         1 Chennai Super Kings            Chennai,Tamil Nadu   Kasi Viswanathan               MS Dhoni                       Stephen Fleming
         2 Mumbai Indians                 Mumbai,Maharashtra   Prakash Iyer                   Rohit Sharma                   Mahela Jayawardene
         3 Royal Challengers Bangalore    Bangalore,Karnataka  Brijesh Patel                  Virat Kohli                    Simon Katich
         4 Sunrisers Hyderabad            Hyderabad,Telengana  K Shanmugam                    David Warner                   Trevor Bayliss
         5 Kings XI Punjab                Mohali,Punjab        Sathish Menon                  KL Rahul                       Anil Kumble
         6 Rajasthan Royals               Jaipur,Rajasthan     Ranjit Barthakur               Steve Smith                    Paddy Upton
         7 Delhi Capitals                 New Delhi            Dheeraj Malhotra               Shreyas Iyer                   Ricky Ponting
         8 Kolkata Knight Riders          Kolkata,West Bengal  Venky Mysore                   Eoin Morgan                    Brendon Mccullum

8 rows selected.
```

FDs are

- **team_id->{all attributes}**
- **team_name -> {all attributes}**
- **city -> {all attributes}**
- **ceo -> {all attributes}**
- **captain -> {all attributes}**
- **head_coach -> {all attributes}**

list of candidate keys :

- **team_id**
- **team_name**
- **city**
- **ceo**
- **captain**

- **head_coach**

The team1 table is in BCNF

2. Player

```
SQL> select * from player;

 PLAYER_ID TEAM_PLAYER PLAYER_NAME               AGE COUNTRY                        ROLE                 MATCHES_PLAYED
---------- ----------- -------------------- ---------- ------------------------------ -------------------- --------------
         1           1 MS Dhoni                     39 IND                            bat                             204
         2           1 FAF du Plessis               36 RSA                            bat                              84
         3           1 Shane Watson                 39 AUS                            bat                             145
         4           1 Ruturaj Gaikwad              23 IND                            bat                               6
         5           1 Ambati Rayudu                35 IND                            bat                             159
         6           1 Sam Curran                   22 UK                             bat/bowl                         23
         7           1 Jadhav                       35 IND                            bat                              87
         8           1 Bravo                        39 WI                             bat/bowl                        140
         9           1 Chahar                       28 IND                            bat/bowl                         48
        10           1 Thakur                       29 IND                            bat/bowl                         45
        11           1 Chawla                       31 IND                            bat/bowl                        164
        12           1 Tahir                        41 RSA                            bat/bowl                         58
        13           2 Rohit Sharma                 33 IND                            bat/bowl                        200
        14           2 Hardik Pandya                27 IND                            bat                              80
        15           2 Ishan Kishan                 22 IND                            bat                              51
        16           2 Kieron Pollard               33 IND                            bat/bowl                        164
        17           2 Jasprit Bumrah               26 IND                            bat/bowl                         92
        18           2 Quintin De Kock              27 IND                            bat                              66
        19           2 Chris Lynn                   30 AUS                            bat                              41
        20           2 Suryakumar Yadav             30 IND                            bat                             101
        21           2 Trent Boult                  31 NZ                             bat/bowl                         48
        22           2 Dhawal Kulkarni              31 IND                            bat/bowl                         91
        23           2 Mitchell Mcclenaghan         34 NZ                             bat/bowl                         56
        24           2 Krunal Pandya                29 IND                            bat/bowl                         71
        25           3 Virat Kohli                  31 IND                            bat                             192
        26           3 AB De Villiers               36 RSA                            bat                             169
        27           3 Devdutt Padikkal             20 IND                            bat                              15
        28           3 Aaron Finch                  33 AUS                            bat                              87
        29           3 Washington Sundar            21 IND                            bat                              36
        30           3 Yuzvendra Chahal             30 IND                            bat/bowl                         99
        31           3 Parthiv Patel                35 IND                            bat/bowl                        139
        32           3 Dale Steyn                   37 RSA                            bat/bowl                         95
        33           3 Umesh Yadav                  33 IND                            bat/bowl                        121
        34           3 Mohammad Siraj               26 IND                            bat/bowl                         35
        35           3 Chirs Morris                 33 RSA                            bat/bowl                         70
        36           4 David Warner                 34 AUS                            bat                             142
        37           4 Manish Pandey                31 IND                            bat                             146
        38           4 Kane Williamson              30 NZ                             bat                              53
        39           4 Mohammad Nabi                35 AFG                            bat/bowl                         14
        40           4 Vijay Shankar                29 IND                            bat/bowl                         40
        41           4 Jason Holder                 29 WI                             bat/bowl                         18
        42           4 Wriddhiman Saha              36 IND                            bat                             124
        43           4 Jonny Bairstow               31 ENG                            bat                              21
        44           4 Rashid Khan                  22 AFG                            bat/bowl                         62
        45           4 Shahbaaz Nadeem              31 IND                            bat/bowl                         71
        46           4 Siddharth Kaul               30 IND                            bat/bowl                         46
        47           5 Chris Gayle                  41 WI                             bat                             132
        48           5 KL Rahul                     28 IND                            bat                              81
        49           5 Glenn Maxwell                32 AUS                            bat/bowl                         82
        50           5 James Neesham                30 NZ                             bat/bowl                          9
        51           5 Nicolas Pooran               25 TNT                            bat                              21
```

```
        51           5 Nicolas Pooran               25 TNT                            bat                              21
        52           5 Mohammad Shami               20 IND                            bat                              63
        53           5 Chris Jordan                 32 BAR                            bat/bowl                         20
        54           5 Sheldon Cottrell             31 WI                             bat/bowl                          6
        55           5 Krishnappa Gowtham           32 IND                            bat/bowl                         24
        56           5 Karun Nair                   28 IND                            bat                              73
        57           6 Steve Smith                  31 AUS                            bat                              95
        58           6 Ben Stokes                   29 ENG                            bat/bowl                         42
        59           6 David Miller                 31 RSA                            bat                              80
        60           6 Rahul Tewatia                27 IND                            bat                              34
        61           6 Robin Uthappa                35 IND                            bat                             189
        62           6 Sanju Samson                 26 IND                            bat                             107
        63           6 Jos Buttler                  30 ENG                            bat                              58
        64           6 Jofra Archer                 25 ENG                            bat/bowl                         35
        65           6 Varun Aaron                  31 IND                            bat/bowl                         50
        66           6 Jaydev Unadkat               29 IND                            bat/bowl                         80
        67           6 Ankit Rajpoot                26 IND                            bat/bowl                         29
        68           7 Shreyas Iyer                 25 IND                            bat                              79
        69           7 Shikhar Dhawan               34 IND                            bat                             176
        70           7 Ajinkya Rahane               32 IND                            bat                             149
        71           7 Prithvi Shaw                 21 IND                            bat                              38
        72           7 Rishabh Pant                 23 IND                            bat                              68
        73           7 Marcus Stoinis               31 AUS                            bat/bowl                         46
        74           7 Axar Patel                   26 IND                            bat/bowl                         97
        75           7 Ravichandran Ashwin          34 IND                            bat/bowl                        154
        76           7 Kagiso Rabada                25 IND                            bat/bowl                         61
        77           7 Anrich Nortje                26 RSA                            bat/bowl                         16
        78           8 Dinesh Karthik               35 IND                            bat                             196
        79           8 Eoin Morgan                  36 IRE                            bat                              66
        80           8 Nitish Rana                  26 IND                            bat                              60
        81           8 Andre Russell                32 WI                             bat/bowl                         74
        82           8 Sunil Narine                 32 WI                             bat/bowl                        120
        83           8 Kuldeep Yadav                25 IND                            bat/bowl                         45
        84           8 Varun Chakravarthy           29 IND                            bat/bowl                         14
        85           8 Lockie Ferguson              29 NZ                             bat/bowl                         14
        86           8 Pat Cummins                  27 AUS                            bat/bowl                         30

6 rows selected.
```

Candidate keys are:

- **player_id -> {all attributes}**
  ➔ It is a candidate key
- **player_name -> {all attributes}**

➔ **candidate key**

- **age, country, role, matches_played -> {all attributes}**

Therefore,

Prime attributes: player_name,player_id,team_player, age, country, role, matches_played

Non prime attributes: team_player

➔ **The table is in 2NF**

3. The Venue entity

```
SQL> select * from Venue;

  VENUE_ID VENUE_NAME                      CAPACITY
---------- ------------------------------ ----------
         1 Chidambaram Stadium                 50000
         2 Wankhede Stadium                    45000
         3 Chinnaswamy Stadium                 40000
         4 Rajiv Gandhi Stadium                55000
         5 PCA Stadium                         30000
         6 Sawai Mansingh Stadium              30000
         7 Arun Jaitley Stadium                48000
         8 Eden Gardens                        90000

8 rows selected.
```

FDs are

- **Venue_id -> {all attributes}**
- **Venue_name -> {all attributes}**

List of prime attributes:

- **Venue_id,venue_name**

Non prime attributes: capacity

Since capacity dependent on either venue_name or venue_id -> partial FD

➔ **Table is in 2NF**

4. The Owner entity

```
SQL> select * from owner;

  OWNER_ID OWNER_NAME                     INCOME_SOURCE                  OWNER_TEAM BUDGET
---------- ------------------------------ ------------------------------ ---------- --------------
         1 India Cements                  cement industry                         1 84.85 crores
        11 Ness Wadia                     businessman                             5 68.50 crores
        12 Preity Zinta                   film actor                              5 68.50 crores
         2 Reliance Industries            telecommunications                      2 83.05 crores
         3 United Spirits                 alcoholic beverages                     3 78.60 crores
         4 Sun TV Network                 media network                           4 74.90 crores
         5 Mohit Burman                   businessman                             5 68.50 crores
         6 Manoj Badale                   businessman                             6 70.25 crores
         7 GMR Group                      infrastructure sector                   7 76.00 crores
         8 JSW Group                      business conglomerate                   7 76.00 crores
         9 Red Chillies Entertainment     film distribution                       8 76.50 crores
        10 Mehta Group                    business conglomerate                   8 76.50 crores

12 rows selected.
```

FDs are

- **Owner_id -> {all attributes}**
- **Owner_name -> {all attributes}**
- **Owner_team -> budget**
- **Budget -> owner_team**

Prime attributes are owner_id, owner_name

Non prime attributes are owner_team and budget and transitive dependency between NPA exists.

➔ **The table is in 2NF**

5. **The sponsors entity**

```
SQL> select * from sponsors;

   TEAM_ID KIT_MANUFACTURER              SHIRT_SPONSOR_FRONT           SHIRT_SPONSOR_BACK            CHEST_BRANDING
---------- ----------------------------- ----------------------------- ----------------------------- -----------------------------
         1 SEVEN                         Muthoot Group                 India Cements                 Gulf Oil
         2 Performax                     Samsung                       Colors                        Mariott Bonvoy
         3 Wrogn Active                  Muthoot Fincorp               DP World                      Myntra
         4 TYKA Sports                   JK Lakshmi Cement             RALCO Tyres                   Valvoline
         5 TIO Sports                    Ebixcash                      Avon Cycles                   Jio
         6 Alcis Sports                  TV9 Bharatvarsh               Nine                          KEI Wires Cables
         7 SQAD Gear                     JSW Group                     Ebixcash                      APL Apollo Steel Tubes
         8 Lux Cozi                      MPL                           JIO                           Lux Cozi

8 rows selected.
```

FDs are

- **Team_id -> {all attributes}**
- **Kit_manufacturer -> {all attributes}**
- **Shirt_sponsor_front -> {all attributes}**
- **Shirt_sponsor_back -> {all attributes}**
- **Chest_branding -> {all attributes}**

➔ **Every key is a superkey**

➔ **The table is in BCNF**

6. **The match entity**

```
SQL> select * from match;

  MATCH_ID WINNER                         LOSER                         MATCH_STAGE     MATCH_DAT   RUN_DIFF  OVER_DIFF
---------- ------------------------------ ------------------------------ --------------- --------- ---------- ----------
         1 Chennai Super Kings            Mumbai Indians                 league          19-SEP-20          4         .8
         2 Delhi Capitals                 Kings XI Punjab                league          20-SEP-20          0          0
         3 Sunrisers Hyderabad            Royal Challengers Bangalore    league          21-SEP-20         10         .6
         4 Rajasthan Royals               Chennai Super Kings            league          22-SEP-20         16          0
         5 Mumbai Indians                 Kolkata Knight Riders          league          23-SEP-20         49          0
         6 Kings XI Punjab                Royal Challengers Bangalore    league          24-SEP-20        103          3
         7 Delhi Capitals                 Chennai Super Kings            league          25-SEP-20         44          0
         8 Kolkata Knight Riders          Sunrisers Hyderabad            league          26-SEP-20          3          2
         9 Rajasthan Royals               Kings XI Punjab                league          27-SEP-20          3         .7
        10 Royal Challengers Bangalore    Mumbai Indians                 league          28-SEP-20          0          0
        11 Sunrisers Hyderabad            Delhi Capitals                 league          29-SEP-20         15          0
        12 Kolkata Knight Riders          Rajasthan Royals               league          30-SEP-20         37          0
        13 Mumbai Indians                 Kings XI Punjab                league          01-OCT-20         48          0
        14 Sunrisers Hyderabad            Chennai Super Kings            league          02-OCT-20          7          0
        15 Royal Challengers Bangalore    Rajasthan Royals               league          03-OCT-20          4         .9
        16 Delhi Capitals                 Kolkata Knight Riders          league          04-OCT-20         18          0
        17 Mumbai Indians                 Sunrisers Hyderabad            league          05-OCT-20         34          0
        18 Chennai Super Kings            Kings XI Punjab                league          06-OCT-20          3        2.2
        19 Delhi Capitals                 Royal Challengers Bangalore    league          07-OCT-20         59          0
        20 Kolkata Knight Riders          Rajasthan Royals               league          08-OCT-20         57        1.5
        21 Delhi Capitals                 Kolkata Knight Riders          qualifier1      09-OCT-20         57          0
        22 Mumbai Indians                 Sunrisers Hyderabad            eliminator      10-OCT-20          1         .6
        23 Mumbai Indians                 Kolkata Knight Riders          qualifier2      11-OCT-20         17          0
        24 Mumbai Indians                 Delhi Capitals                 final           12-OCT-20          1        1.2

24 rows selected.
```

FDs are

- **Match_id -> {all attributes}**
- **Match_date -> {all attributes}**
- **Run_diff, over_diff, winner -> {all attributes}**
- **Run_diff, over_diff, loser -> {all attributes}**

Prime attributes are : match_id, match_date, run_diff, over_diff, winner, loser

Non prime attributes are: match_stage

➔ **The match table is in 2NF**

Now decomposing into

➔ **R1 (match_id, winner, loser, match_date, run_diff, over_diff)**
➔ **R2 (match_id, match_stage)**
➔ **Since partial FDs are removed, table is converted to 3NF**

7. The points table entity

```
SQL> select * from points_table;

   TEAM_ID TEAM_NAME                       PLAYED        WON       LOST     POINTS        NRR
---------- ------------------------------ ---------- ---------- ---------- ---------- ----------
         1 Chennai Super Kings                     5          2          3          4       -.57
         2 Mumbai Indians                          8          6          2         12       1.47
         3 Royal Challengers Bangalore             5          2          3          4     -1.707
         4 Sunrisers Hyderabad                     6          3          3          6       -.08
         5 Kings XI Punjab                         5          1          4          2       .491
         6 Rajasthan Royals                        5          2          3          4       -.807
         7 Delhi Capitals                          7          5          2         10      1.608
         8 Kolkata Knight Riders                   7          3          4          6       -.405

8 rows selected.

SQL>
```

FDs are

- **Team_id -> {all attributes}**
- **Team_name -> {all attributes}**
- **Nrr -> {all attributes}**
- **Won -> points**

Prime attributes are: team_id, team_name, nrr

Non prime attributes are: played, won, lost, points

➔ **Since won->points , both are non prime attributes so 3NF is violated**

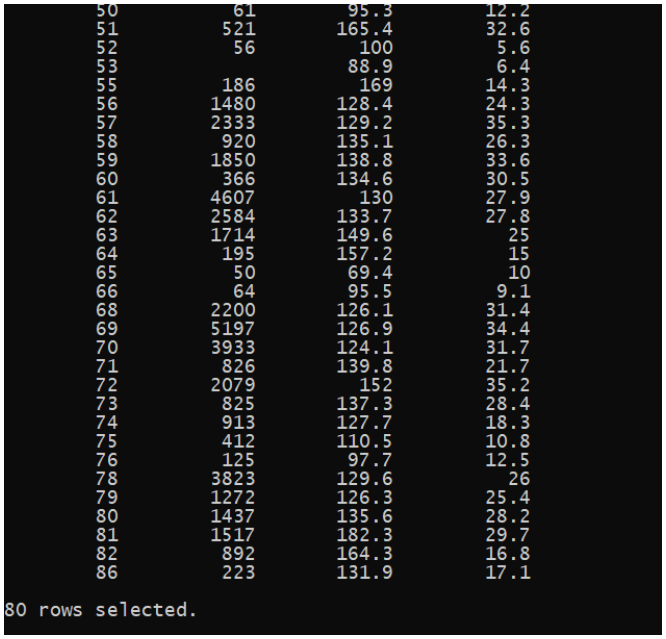
The points_table entity is in 2NF

Now, decomposing it into 2 tables

➔ **R1(team_id,team_name,played,won,lost,nrr)**
➔ **R2(team_id,team_name,played,lost,points,nrr)**
➔ **It is converted to BCNF as no partial FDs, no transitive dependencies, every key is superkey**

8. The batsman entity

```
SQL> select * from batsman;

 PLAYER_ID RUNS_SCORED STRIKE_RATE BATTING_AVG
---------- ----------- ----------- -----------
         1        4632       136.4          41
         2        2302       129.2        32.9
         3        3874       137.9          31
         4         204       120.7          51
         5        3659       126.1        29.5
         6         281       143.4        23.4
         7        1141       124.2        22.8
         8        1490       128.2        22.6
         9        1271        22.2        28.2
        10        1340        19.6        29.1
        11        4263        20.8        27.3
        12        1687        16.1        21.1
        13        5280       130.6        31.3
        14        1349       159.3          30
        15        1211       136.8        28.8
        16        3023       149.9        29.9
        17          40        97.6        13.7
        18        1959       133.5        31.6
        19        1280       140.5        33.7
        20        2024       134.6        30.2
        21                     80           4
        22         104        96.3        11.6
        23          85       121.4         6.5
        24        1000       142.4          25
        25        5878       130.7        38.2
        26        4849       151.9        40.4
        27         473       124.8        31.5
        28        2005       127.7        25.7
        29         186       125.7        15.5
        30                    43.1         3.7
        31        2848       120.8        22.6
        32         167       104.4         7.6
        33         122        95.3         8.7
        34          46          92        11.5
        35         551       157.9        23.9
        36        5254       141.5        42.7
        37        3268       121.7        29.7
        38        1619       134.8        39.5
        39         146       147.5        16.2
        40         654       127.7        29.7
        41         104       123.8        14.8
        42        1979        25.7         132
        43         790       142.3        41.6
        44         139       149.5         8.7
        45          39        45.3           3
        46                    42.9           3
        47        4772       150.1        41.1
        48        2647       135.8        44.9
        49        1505       154.7        22.1
        50          61        95.3        12.2
```



50	61	95.3	12.2
51	521	165.4	32.6
52	56	100	5.6
53		88.9	6.4
55	186	169	14.3
56	1480	128.4	24.3
57	2333	129.2	35.3
58	920	135.1	26.3
59	1850	138.8	33.6
60	366	134.6	30.5
61	4607	130	27.9
62	2584	133.7	27.8
63	1714	149.6	25
64	195	157.2	15
65	50	69.4	10
66	64	95.5	9.1
68	2200	126.1	31.4
69	5197	126.9	34.4
70	3933	124.1	31.7
71	826	139.8	21.7
72	2079	152	35.2
73	825	137.3	28.4
74	913	127.7	18.3
75	412	110.5	10.8
76	125	97.7	12.5
78	3823	129.6	26
79	1272	126.3	25.4
80	1437	135.6	28.2
81	1517	182.3	29.7
82	892	164.3	16.8
86	223	131.9	17.1

80 rows selected.

FDs are

- **Player_id -> {all attributes}**

➔ **Table is in BCNF**

9. The bowler entity

```
SQL> select * from bowler;

 PLAYER_ID NO_OF_WICKETS OVERS_BOWLED    ECONOMY BOWLING_AVG
---------- ------------- ------------ ---------- --------------------
         6            45          400       7.62 28.2
         8           153         2700        8.4 24.81
         9            23          450       8.89 29
        10            46          500       8.92 29.1
        11           156         3000       7.87 27.3
        12            80         1650       7.83 21.1
        14            42          400       9.06 31.3
        16            60          905       8.87 32.7
        17           109         1500       7.41 23.7
        21            63          804       8.53 25
        22            86         1023       8.25 28.2
        23            71         1023       8.49 25.4
        24            46          700       7.26 32.8
        29            24          450       6.87 31.2
        30           121          893       7.67 22.5
        32            97          768       6.91 25.9
        33           119          678       8.51 30.1
        34            39          243       9.08 27.8
        35            80         1098       7.81 24
        39            11          202       6.54 29.3
        40                         90       8.42 38.2
        41            19          270       8.42 28.4
        44            75          644       6.24 20.5
        45            47          342       7.53 37.2
        46            51          605       8.65 28.4
        49            19          195       8.57 41
        52            60          807       8.89 33.5
        53            21          810       9.33 28.7
        54                         80        8.8 29.3
        55            13          109       8.26 43.2
        58            28          454       8.52 34.4
        60            24          214       7.13 28.3
        64            46          225       7.13 21.3
        65            42          105       8.89 34
        66            81          402       8.83 29.9
        67            24          197       9.23 33.9
        73            28          165       9.37 30.4
        74            80          162       7.29 30.7
        75           138          750       6.87 26.8
        76            61          255       8.23 18.1
        77            22          123       8.39 23.3
        81            61          330       8.96 28.1
        82           127          606       6.77 24.8
        83            40          244       8.27 30.9
        84            18          244        7.1 21.7
        85            11          110        8.5 38.5
        86            29          110          8 31.3

47 rows selected.
```

FDs are

- **Player_id -> {all attributes}**

➔ **Bowler entity is in BCNF**

8. Transaction Processing

Creating a trigger to prevent deletion of matches with huge run difference > 100

```
SQL> create or replace trigger trans
  2  after
  3  delete
  4  on match
  5  for each row
  6  begin
  7     if :old.run_diff>100 then
  8             raise_application_error(-20200,'Row cant be deleted');
  9     end if;
 10  end;
 11  /

Trigger created.

SQL>
```

Now starting the transaction

Begin transaction

Set transaction read write isolation level read committed name='del_rundiff';

Delete from match where run_diff=103;

Commit;

Exception

When others then

Rollback;

End;

/

- **Makes a delete operation**
- **Trigger 'trans' is associated with prevention of deletion of any row that has run_diff>100**

This transaction will rollback since the trigger raises an error that run_diff>100 so transaction fails

If run_diff<100 in the transaction statement, it would have got committed

ii) Locking

Also locking can be implemented on the database to have concurrency.

<u>Query Optimization</u>

Since we have a lot of information about each player stored in multiple tables, (for example player is a superclass of batsman and bowler overlapping classes), to retrieve all the player data at once involves complex time consuming queries.

To reduce this time, we need to optimize it to achieve least time and cost

Ex: selecting details of players from 3 tables with extra conditions to be satisfied

```
SQL> select player_name,runs_scored,no_of_wickets from bowler join player on bowler.player_id=player.player_id join batsman on player.player_id=batsman.player_id where bats
man.runs_scored>250 and no_of_wickets>30;

PLAYER_NAME          RUNS_SCORED NO_OF_WICKETS
-------------------- ----------- -------------
Sam Curran                   281            45
Bravo                       1490           153
Thakur                      1340            46
Chawla                      4263           156
Tahir                       1687            80
Hardik Pandya               1349            42
Kieron Pollard              3023            60
Krunal Pandya               1000            46
Chirs Morris                 551            80
Axar Patel                   913            80
Ravichandran Ashwin          412           138
Andre Russell               1517            61
Sunil Narine                 892           127

13 rows selected.
```

Usually, for less optimal queries the join operations are done first leading to much larger amount of tuples which is then scanned for further conditions and selection of columns.

Relational algebra of the less optimal query

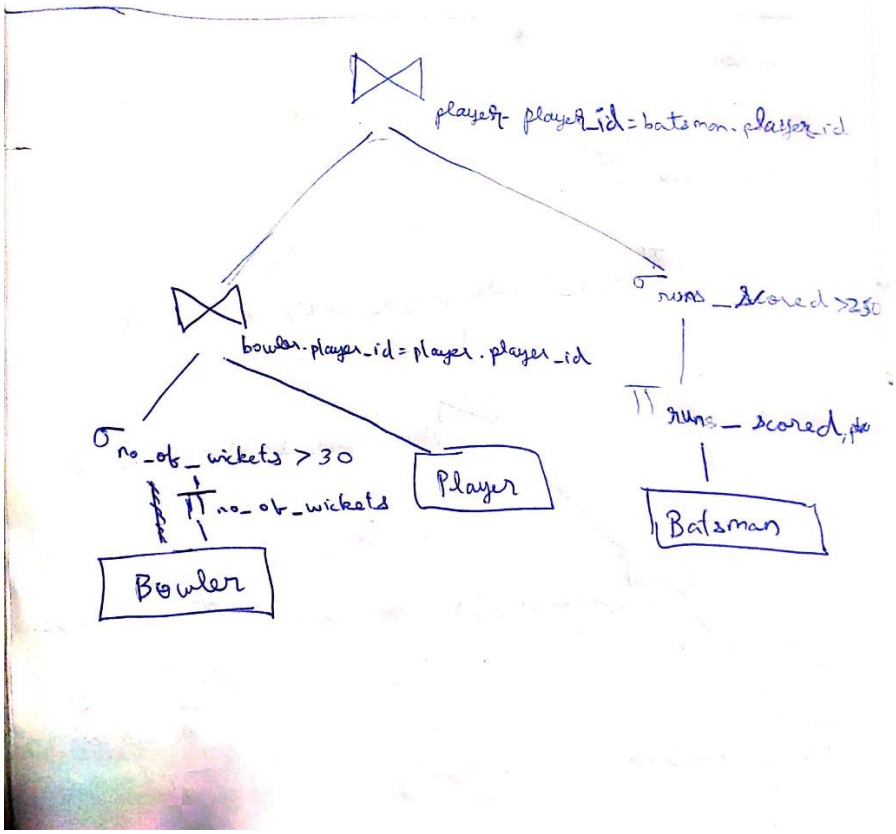
$$((\Pi_{no\_of\_wickets,player\_name,runs\_scored})(\sigma_{no\_of\_wickets=>30 \wedge runs\_scored>250}) \bowtie_{player.player\_id=bowler.player\_id} (player)) \bowtie_{player.player\_id=batsman.player\_id} (batsman));$$

➔ Less optimal since projections and selections are done when seeing very large number of tuples thus increasing its complexity and cost of the query

Query Tree Generation

Now, generating the query tree:

- Tables are leaf nodes
- Relational algebra operators are inner nodes



The below query is a more optimal query since projections and selection operations are done first which leads to lesser number of tuples in the starting part of the query.

$$((\Pi_{no\_of\_wickets,player\_name}(\sigma_{no\_of\_wickets>30})(bowler)) \bowtie_{player.player\_id=bowler.player\_id} (player)) \bowtie_{player.player\_id=batsman.player\_id} (\Pi_{runs\_scored}(\sigma_{runs\_scored>250})(batsman));$$

INDEXING:

Index is created on team_id,team_name in team1 entity and player_id,player_name in player entity to produce faster results.

```
SQL> create index player on player(player_id,player_name);
Index created.
SQL>
```

```
SQL> create index team_ind on team1(team_id,team_name);
Index created.
SQL>
```

This would help in faster retrieval of data from the database.

x----------x----------x