R Assignment

Group 1

2024-06-14

```
#------------------------------------------------------------------------------#
```

```r
library(tidyverse)
```

```
## -- Attaching core tidyverse packages ----------------------- tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------- tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```r
library(dplyr)
library(DescTools)
library(ggplot2)

players_ds <- read.csv("R Assignment/players.csv")

# Print the structure of your dataset
str(players_ds)
```

```
## 'data.frame':    30521 obs. of  23 variables:
##  $ player_id                   : int  10 26 65 77 80 109 123 132 162 215 ...
##  $ first_name                  : chr  "Miroslav" "Roman" "Dimitar" "" ...
##  $ last_name                   : chr  "Klose" "Weidenfeller" "Berbatov" "Lúcio" ...
##  $ name                        : chr  "Miroslav Klose" "Roman Weidenfeller" "Dimitar Berbatov" ...
##  $ last_season                 : int  2015 2017 2015 2012 2017 2013 2012 2015 2012 2015 ...
##  $ current_club_id             : int  398 16 1091 506 27 825 33 11 79 1084 ...
##  $ player_code                 : chr  "miroslav-klose" "roman-weidenfeller" "dimitar-berbatov" ...
##  $ country_of_birth            : chr  "Poland" "Germany" "Bulgaria" "Brazil" ...
##  $ city_of_birth               : chr  "Opole" "Diez" "Blagoevgrad" "Brasília" ...
##  $ country_of_citizenship      : chr  "Germany" "Germany" "Bulgaria" "Brazil" ...
##  $ date_of_birth               : chr  "1978-06-09" "1980-08-06" "1981-01-30" "1978-05-08" ...
##  $ sub_position                : chr  "Centre-Forward" "Goalkeeper" "Centre-Forward" "Centre-...
##  $ position                    : chr  "Attack" "Goalkeeper" "Attack" "Defender" ...
##  $ foot                        : chr  "right" "left" "" "" ...
##  $ height_in_cm                : int  184 190 NA NA 194 NA NA 179 193 193 ...
```

```
##  $ contract_expiration_date       : chr  "" "" "" "" ...
##  $ agent_name                      : chr  "ASBW Sport Marketing" "Neubauer 13 GmbH" "CSKA-AS-23
##  $ image_url                       : chr  "https://img.a.transfermarkt.technology/portrait/heade
##  $ url                             : chr  "https://www.transfermarkt.co.uk/miroslav-klose/profil,
##  $ current_club_domestic_competition_id: chr  "IT1" "L1" "GR1" "IT1" ...
##  $ current_club_name               : chr  "Società Sportiva Lazio S.p.A." "Borussia Dortmund" "Pa
##  $ market_value_in_eur             : int  1000000 750000 1000000 200000 100000 400000 1500000 350
##  $ highest_market_value_in_eur     : int  30000000 8000000 34500000 24500000 3000000 9500000 9500
```

`#---------------------------------------------------------------------------------#`

```r
# List the variables in your dataset
players_ds_vars <- names(players_ds)
print(players_ds_vars)
```

```
##  [1] "player_id"
##  [2] "first_name"
##  [3] "last_name"
##  [4] "name"
##  [5] "last_season"
##  [6] "current_club_id"
##  [7] "player_code"
##  [8] "country_of_birth"
##  [9] "city_of_birth"
## [10] "country_of_citizenship"
## [11] "date_of_birth"
## [12] "sub_position"
## [13] "position"
## [14] "foot"
## [15] "height_in_cm"
## [16] "contract_expiration_date"
## [17] "agent_name"
## [18] "image_url"
## [19] "url"
## [20] "current_club_domestic_competition_id"
## [21] "current_club_name"
## [22] "market_value_in_eur"
## [23] "highest_market_value_in_eur"
```

`#---------------------------------------------------------------------------------#`

```r
# Print the top 15 rows of your dataset
players_ds_top15 <- head(players_ds,15)
print (players_ds_top15)
```

```
##    player_id first_name    last_name                name last_season
## 1         10   Miroslav        Klose       Miroslav Klose        2015
## 2         26      Roman  Weidenfeller  Roman Weidenfeller        2017
## 3         65     Dimitar     Berbatov     Dimitar Berbatov        2015
## 4         77                   Lúcio                Lúcio        2012
## 5         80        Tom       Starke          Tom Starke        2017
## 6        109                    Dedê                 Dedê        2013
## 7        123  Christoph    Metzelder  Christoph Metzelder        2012
```

```
## 8        132        Tomas        Rosicky         Tomas Rosicky         2015
## 9        162         Marc        Ziegler          Marc Ziegler         2012
## 10       215         Roque     Santa Cruz      Roque Santa Cruz        2015
## 11       258        Gerald        Asamoah        Gerald Asamoah        2013
## 12       264         Tamás         Hajnal          Tamás Hajnal        2012
## 13       276        Sladan          Peric          Sladan Peric        2013
## 14       277  Sérgio da Silva Pinto  Sérgio da Silva Pinto            2013
## 15       299        Fabian          Ernst          Fabian Ernst        2012
##    current_club_id        player_code    country_of_birth    city_of_birth
## 1              398      miroslav-klose              Poland            Opole
## 2               16   roman-weidenfeller             Germany            Diez
## 3             1091     dimitar-berbatov            Bulgaria       Blagoevgrad
## 4              506                lucio              Brazil         Brasília
## 5               27           tom-starke  East Germany (GDR)          Freital
## 6              825                 dede              Brazil    Belo Horizonte
## 7               33   christoph-metzelder             Germany          Haltern
## 8               11        tomas-rosicky                CSSR            Praha
## 9               79          marc-ziegler             Germany       Blieskastel
## 10            1084      roque-santa-cruz            Paraguay         Asunción
## 11              33        gerald-asamoah               Ghana          Mampong
## 12              79         tamas-hajnal             Hungary         Esztergom
## 13           20100          sladan-peric
## 14            3368  sergio-da-silva-pinto            Portugal Vila Nova de Gaia
## 15           10484          fabian-ernst             Germany          Hannover
##    country_of_citizenship date_of_birth      sub_position    position  foot
## 1                 Germany    1978-06-09    Centre-Forward      Attack right
## 2                 Germany    1980-08-06        Goalkeeper  Goalkeeper  left
## 3                Bulgaria    1981-01-30    Centre-Forward      Attack
## 4                  Brazil    1978-05-08       Centre-Back    Defender
## 5                 Germany    1981-03-18        Goalkeeper  Goalkeeper right
## 6                  Brazil    1978-04-18         Left-Back    Defender
## 7                 Germany    1980-11-05       Centre-Back    Defender
## 8          Czech Republic    1980-10-04 Attacking Midfield   Midfield  both
## 9                 Germany    1976-06-13        Goalkeeper  Goalkeeper right
## 10               Paraguay    1981-08-16    Centre-Forward      Attack right
## 11                Germany    1978-10-03    Centre-Forward      Attack right
## 12                Hungary    1981-03-15 Attacking Midfield   Midfield  both
## 13                Denmark    1982-04-15       Centre-Back    Defender
## 14                Germany    1980-10-16   Central Midfield   Midfield right
## 15                Germany               Defensive Midfield   Midfield right
##    height_in_cm contract_expiration_date         agent_name
## 1           184                          ASBW Sport Marketing
## 2           190                           Neubauer 13 GmbH
## 3            NA                            CSKA-AS-23 Ltd.
## 4            NA
## 5           194                                        IFM
## 6            NA                          Football Concept
## 7            NA
## 8           179
## 9           193
## 10          193      2023-12-31 00:00:00
## 11          180
## 12          167
## 13           NA
```

```
## 14          176
## 15          183
##                                                                      image_url
## 1        https://img.a.transfermarkt.technology/portrait/header/10-1448468291.jpg?lm=1
## 2        https://img.a.transfermarkt.technology/portrait/header/26-1502448725.jpg?lm=1
## 3        https://img.a.transfermarkt.technology/portrait/header/65-1683670068.jpg?lm=1
## 4        https://img.a.transfermarkt.technology/portrait/header/77-1458201664.jpg?lm=1
## 5        https://img.a.transfermarkt.technology/portrait/header/80-1471439914.JPG?lm=1
## 6       https://img.a.transfermarkt.technology/portrait/header/109-1487263703.jpg?lm=1
## 7       https://img.a.transfermarkt.technology/portrait/header/s_123_33_2012_1.jpg?lm=1
## 8       https://img.a.transfermarkt.technology/portrait/header/132-1464947592.jpg?lm=1
## 9       https://img.a.transfermarkt.technology/portrait/header/s_162_79_2012_1.jpg?lm=1
## 10      https://img.a.transfermarkt.technology/portrait/header/215-1564992591.png?lm=1
## 11      https://img.a.transfermarkt.technology/portrait/header/258-1590420180.jpg?lm=1
## 12      https://img.a.transfermarkt.technology/portrait/header/s_264_79_2012_2.jpg?lm=1
## 13      https://img.a.transfermarkt.technology/portrait/header/276-1637687071.jpg?lm=1
## 14      https://img.a.transfermarkt.technology/portrait/header/277-1438158926.jpg?lm=1
## 15 https://img.a.transfermarkt.technology/portrait/header/s_299_123_2014_01_10_2.jpg?lm=1
##                                                                            url
## 1            https://www.transfermarkt.co.uk/miroslav-klose/profil/spieler/10
## 2        https://www.transfermarkt.co.uk/roman-weidenfeller/profil/spieler/26
## 3         https://www.transfermarkt.co.uk/dimitar-berbatov/profil/spieler/65
## 4                  https://www.transfermarkt.co.uk/lucio/profil/spieler/77
## 5             https://www.transfermarkt.co.uk/tom-starke/profil/spieler/80
## 6                  https://www.transfermarkt.co.uk/dede/profil/spieler/109
## 7    https://www.transfermarkt.co.uk/christoph-metzelder/profil/spieler/123
## 8         https://www.transfermarkt.co.uk/tomas-rosicky/profil/spieler/132
## 9           https://www.transfermarkt.co.uk/marc-ziegler/profil/spieler/162
## 10      https://www.transfermarkt.co.uk/roque-santa-cruz/profil/spieler/215
## 11        https://www.transfermarkt.co.uk/gerald-asamoah/profil/spieler/258
## 12          https://www.transfermarkt.co.uk/tamas-hajnal/profil/spieler/264
## 13          https://www.transfermarkt.co.uk/sladan-peric/profil/spieler/276
## 14 https://www.transfermarkt.co.uk/sergio-da-silva-pinto/profil/spieler/277
## 15        https://www.transfermarkt.co.uk/fabian-ernst/profil/spieler/299
##    current_club_domestic_competition_id
## 1                                    IT1
## 2                                     L1
## 3                                    GR1
## 4                                    IT1
## 5                                     L1
## 6                                    TR1
## 7                                     L1
## 8                                    GB1
## 9                                     L1
## 10                                   ES1
## 11                                    L1
## 12                                    L1
## 13                                   DK1
## 14                                   ES1
## 15                                   TR1
##                                   current_club_name market_value_in_eur
## 1                         Società Sportiva Lazio S.p.A.           1000000
## 2                                 Borussia Dortmund            750000
## 3  Panthessalonikios Athlitikos Omilos Konstantinoupoliton          1000000
```

```
## 4                                              Juventus Football Club                 200000
## 5                                               FC Bayern München                 100000
## 6                                                    Eskisehirspor                 400000
## 7                                                  FC Schalke 04                1500000
## 8                                              Arsenal Football Club                 350000
## 9              Verein für Bewegungsspiele Stuttgart 1893                 200000
## 10                                                      Málaga CF                 250000
## 11                                                  FC Schalke 04                 100000
## 12             Verein für Bewegungsspiele Stuttgart 1893                 100000
## 13                                               FC Vestsjaelland                 200000
## 14                                                    Levante UD                 150000
## 15                                        Kasımpaşa Spor Kulübü                1500000
##    highest_market_value_in_eur
## 1                      30000000
## 2                       8000000
## 3                      34500000
## 4                      24500000
## 5                       3000000
## 6                       9500000
## 7                       9500000
## 8                      17500000
## 9                       1250000
## 10                     12000000
## 11                      7000000
## 12                      6500000
## 13                       500000
## 14                      3500000
## 15                      9000000
```

```r
head(players_ds,15)
```

```
##    player_id first_name       last_name                      name last_season
## 1         10   Miroslav           Klose           Miroslav Klose        2015
## 2         26      Roman     Weidenfeller      Roman Weidenfeller        2017
## 3         65    Dimitar        Berbatov         Dimitar Berbatov        2015
## 4         77                       Lúcio                    Lúcio        2012
## 5         80        Tom          Starke               Tom Starke        2017
## 6        109                        Dedê                     Dedê        2013
## 7        123   Christoph       Metzelder      Christoph Metzelder        2012
## 8        132      Tomas         Rosicky            Tomas Rosicky        2015
## 9        162       Marc         Ziegler             Marc Ziegler        2012
## 10       215      Roque      Santa Cruz          Roque Santa Cruz        2015
## 11       258     Gerald          Asamoah           Gerald Asamoah        2013
## 12       264      Tamás          Hajnal             Tamás Hajnal        2012
## 13       276     Sladan           Peric             Sladan Peric        2013
## 14       277     Sérgio  da Silva Pinto  Sérgio da Silva Pinto        2013
## 15       299     Fabian           Ernst             Fabian Ernst        2012
##    current_club_id        player_code    country_of_birth      city_of_birth
## 1              398       miroslav-klose              Poland              Opole
## 2               16   roman-weidenfeller             Germany               Diez
## 3             1091     dimitar-berbatov            Bulgaria         Blagoevgrad
## 4              506                 lucio              Brazil           Brasília
## 5               27           tom-starke East Germany (GDR)             Freital
## 6              825                  dede              Brazil      Belo Horizonte
```

```
## 7             33    christoph-metzelder        Germany         Haltern
## 8             11       tomas-rosicky            CSSR           Praha
## 9             79        marc-ziegler           Germany       Blieskastel
## 10          1084     roque-santa-cruz          Paraguay       Asunción
## 11            33      gerald-asamoah            Ghana         Mampong
## 12            79        tamas-hajnal            Hungary       Esztergom
## 13         20100        sladan-peric
## 14          3368 sergio-da-silva-pinto         Portugal Vila Nova de Gaia
## 15         10484       fabian-ernst            Germany        Hannover
##    country_of_citizenship date_of_birth       sub_position   position  foot
## 1              Germany     1978-06-09   Centre-Forward      Attack right
## 2              Germany     1980-08-06      Goalkeeper Goalkeeper  left
## 3              Bulgaria    1981-01-30   Centre-Forward      Attack
## 4              Brazil      1978-05-08      Centre-Back     Defender
## 5              Germany     1981-03-18      Goalkeeper Goalkeeper right
## 6              Brazil      1978-04-18       Left-Back      Defender
## 7              Germany     1980-11-05      Centre-Back     Defender
## 8        Czech Republic    1980-10-04 Attacking Midfield    Midfield  both
## 9              Germany     1976-06-13      Goalkeeper Goalkeeper right
## 10             Paraguay    1981-08-16   Centre-Forward      Attack right
## 11             Germany     1978-10-03   Centre-Forward      Attack right
## 12             Hungary     1981-03-15 Attacking Midfield    Midfield  both
## 13             Denmark     1982-04-15      Centre-Back     Defender
## 14             Germany     1980-10-16   Central Midfield    Midfield right
## 15             Germany               Defensive Midfield    Midfield right
##    height_in_cm contract_expiration_date          agent_name
## 1           184                         ASBW Sport Marketing
## 2           190                          Neubauer 13 GmbH
## 3            NA                           CSKA-AS-23 Ltd.
## 4            NA
## 5           194                                       IFM
## 6            NA                          Football Concept
## 7            NA
## 8           179
## 9           193
## 10          193      2023-12-31 00:00:00
## 11          180
## 12          167
## 13           NA
## 14          176
## 15          183
##                                                                      image_url
## 1        https://img.a.transfermarkt.technology/portrait/header/10-1448468291.jpg?lm=1
## 2        https://img.a.transfermarkt.technology/portrait/header/26-1502448725.jpg?lm=1
## 3        https://img.a.transfermarkt.technology/portrait/header/65-1683670068.jpg?lm=1
## 4        https://img.a.transfermarkt.technology/portrait/header/77-1458201664.jpg?lm=1
## 5        https://img.a.transfermarkt.technology/portrait/header/80-1471439914.JPG?lm=1
## 6       https://img.a.transfermarkt.technology/portrait/header/109-1487263703.jpg?lm=1
## 7      https://img.a.transfermarkt.technology/portrait/header/s_123_33_2012_1.jpg?lm=1
## 8       https://img.a.transfermarkt.technology/portrait/header/132-1464947592.jpg?lm=1
## 9      https://img.a.transfermarkt.technology/portrait/header/s_162_79_2012_1.jpg?lm=1
## 10      https://img.a.transfermarkt.technology/portrait/header/215-1564992591.png?lm=1
## 11      https://img.a.transfermarkt.technology/portrait/header/258-1590420180.jpg?lm=1
## 12     https://img.a.transfermarkt.technology/portrait/header/s_264_79_2012_2.jpg?lm=1
```

```
## 13       https://img.a.transfermarkt.technology/portrait/header/276-1637687071.jpg?lm=1
## 14       https://img.a.transfermarkt.technology/portrait/header/277-1438158926.jpg?lm=1
## 15 https://img.a.transfermarkt.technology/portrait/header/s_299_123_2014_01_10_2.jpg?lm=1
##                                                                                       url
## 1         https://www.transfermarkt.co.uk/miroslav-klose/profil/spieler/10
## 2       https://www.transfermarkt.co.uk/roman-weidenfeller/profil/spieler/26
## 3        https://www.transfermarkt.co.uk/dimitar-berbatov/profil/spieler/65
## 4                 https://www.transfermarkt.co.uk/lucio/profil/spieler/77
## 5              https://www.transfermarkt.co.uk/tom-starke/profil/spieler/80
## 6                  https://www.transfermarkt.co.uk/dede/profil/spieler/109
## 7     https://www.transfermarkt.co.uk/christoph-metzelder/profil/spieler/123
## 8           https://www.transfermarkt.co.uk/tomas-rosicky/profil/spieler/132
## 9            https://www.transfermarkt.co.uk/marc-ziegler/profil/spieler/162
## 10        https://www.transfermarkt.co.uk/roque-santa-cruz/profil/spieler/215
## 11         https://www.transfermarkt.co.uk/gerald-asamoah/profil/spieler/258
## 12           https://www.transfermarkt.co.uk/tamas-hajnal/profil/spieler/264
## 13           https://www.transfermarkt.co.uk/sladan-peric/profil/spieler/276
## 14 https://www.transfermarkt.co.uk/sergio-da-silva-pinto/profil/spieler/277
## 15          https://www.transfermarkt.co.uk/fabian-ernst/profil/spieler/299
##     current_club_domestic_competition_id
## 1                                     IT1
## 2                                      L1
## 3                                     GR1
## 4                                     IT1
## 5                                      L1
## 6                                     TR1
## 7                                      L1
## 8                                     GB1
## 9                                      L1
## 10                                    ES1
## 11                                     L1
## 12                                     L1
## 13                                    DK1
## 14                                    ES1
## 15                                    TR1
##                                      current_club_name market_value_in_eur
## 1                         Società Sportiva Lazio S.p.A.             1000000
## 2                                    Borussia Dortmund              750000
## 3  Panthessalonikios Athlitikos Omilos Konstantinoupoliton             1000000
## 4                              Juventus Football Club              200000
## 5                                  FC Bayern München              100000
## 6                                      Eskisehirspor              400000
## 7                                     FC Schalke 04             1500000
## 8                               Arsenal Football Club              350000
## 9          Verein für Bewegungsspiele Stuttgart 1893              200000
## 10                                        Málaga CF              250000
## 11                                    FC Schalke 04              100000
## 12         Verein für Bewegungsspiele Stuttgart 1893              100000
## 13                                  FC Vestsjaelland              200000
## 14                                        Levante UD              150000
## 15                                Kasımpaşa Spor Kulübü             1500000
##     highest_market_value_in_eur
## 1                      30000000
## 2                       8000000
```

```
## 3                           34500000
## 4                           24500000
## 5                            3000000
## 6                            9500000
## 7                            9500000
## 8                           17500000
## 9                            1250000
## 10                          12000000
## 11                           7000000
## 12                           6500000
## 13                            500000
## 14                           3500000
## 15                           9000000
```

```
#---------------------------------------------------------------------------#

# Write a user defined function using any of the variables from the data set.
# Function to return the no of players having market value greate than 10 million
player_count <- function (market_value, threshold){
  count <- 0
  for (mv in market_value){
    if (!is.na(mv) && mv > threshold){
      count <- count +1
    }
  }
  return(count)
}
threshold <- 10000000
players_above_threshold <- player_count(players_ds$market_value_in_eur,threshold)

print(paste("The number of players with market value above 10 million are : ", players_above_threshold))
```

```
## [1] "The number of players with market value above 10 million are :  976"
```

```
#---------------------------------------------------------------------------#

#Use data manipulation techniques and filter rows based on any logical criteria that exist in your data
#Players who are taller than 190 cm and have market value above 5 million euros
filtered_players <- players_ds %>% filter(height_in_cm > 190, market_value_in_eur > 5000000)
print(paste("Players taller than 190cm and market value above 5 million :",nrow(filtered_players)))
```

```
## [1] "Players taller than 190cm and market value above 5 million : 192"
```

```
head(filtered_players)
```

```
##   player_id first_name last_name             name last_season current_club_id
## 1     44058   Wojciech  Szczęsny Wojciech Szczęsny        2023             506
## 2     82105       Joel     Matip       Joel Matip        2023              31
## 3     96341     Romelu    Lukaku    Romelu Lukaku        2023              12
## 4    105470               Alisson          Alisson        2023              31
## 5    108390    Thibaut  Courtois  Thibaut Courtois        2023             418
## 6    108725      Chris      Wood       Chris Wood        2023             703
```

```
##          player_code country_of_birth city_of_birth country_of_citizenship
## 1 wojciech-szczesny          Poland       Warszawa                 Poland
## 2       joel-matip          Germany         Bochum               Cameroon
## 3    romelu-lukaku          Belgium      Antwerpen                Belgium
## 4          alisson           Brazil Novo Hamburgo                 Brazil
## 5  thibaut-courtois         Belgium           Bree                Belgium
## 6       chris-wood      New Zealand       Auckland            New Zealand
##   date_of_birth    sub_position    position  foot height_in_cm
## 1    1990-04-18      Goalkeeper Goalkeeper right          196
## 2    1991-08-08     Centre-Back   Defender right          195
## 3    1993-05-13 Centre-Forward     Attack  left          191
## 4    1992-10-02      Goalkeeper Goalkeeper right          193
## 5    1992-05-11      Goalkeeper Goalkeeper  left          200
## 6    1991-12-07 Centre-Forward     Attack right          191
##   contract_expiration_date             agent_name
## 1      2025-06-30 00:00:00            CAA Stellar
## 2      2024-06-30 00:00:00 ASBW Sport Marketing
## 3      2024-06-30 00:00:00            TEAM LUKAKU
## 4      2027-06-30 00:00:00
## 5      2026-06-30 00:00:00  Christophe Henrotay
## 6      2024-06-30 00:00:00            CAA Base Ltd
##                                                                     image_url
## 1  https://img.a.transfermarkt.technology/portrait/header/44058-1595847517.jpg?lm=1
## 2  https://img.a.transfermarkt.technology/portrait/header/82105-1702049783.jpg?lm=1
## 3  https://img.a.transfermarkt.technology/portrait/header/96341-1661780981.jpg?lm=1
## 4 https://img.a.transfermarkt.technology/portrait/header/105470-1668522221.jpg?lm=1
## 5 https://img.a.transfermarkt.technology/portrait/header/108390-1717280733.jpg?lm=1
## 6 https://img.a.transfermarkt.technology/portrait/header/108725-1674209978.jpg?lm=1
##                                                                           url
## 1 https://www.transfermarkt.co.uk/wojciech-szczesny/profil/spieler/44058
## 2         https://www.transfermarkt.co.uk/joel-matip/profil/spieler/82105
## 3     https://www.transfermarkt.co.uk/romelu-lukaku/profil/spieler/96341
## 4          https://www.transfermarkt.co.uk/alisson/profil/spieler/105470
## 5 https://www.transfermarkt.co.uk/thibaut-courtois/profil/spieler/108390
## 6       https://www.transfermarkt.co.uk/chris-wood/profil/spieler/108725
##   current_club_domestic_competition_id              current_club_name
## 1                                  IT1         Juventus Football Club
## 2                                  GB1        Liverpool Football Club
## 3                                  IT1        Associazione Sportiva Roma
## 4                                  GB1        Liverpool Football Club
## 5                                  ES1    Real Madrid Club de Fútbol
## 6                                  GB1 Nottingham Forest Football Club
##   market_value_in_eur highest_market_value_in_eur
## 1             6000000                    40000000
## 2             8000000                    40000000
## 3            30000000                   100000000
## 4            28000000                    90000000
## 5            28000000                    75000000
## 6             7000000                    18000000
```

```
#----------------------------------------------------------------------------#

#Identify the dependent & independent variables and use reshaping techniques and create a new data fram
```

```r
players_ds_personal <- players_ds[, c("player_id", "first_name", "last_name", "country_of_birth")]
players_ds_club <- players_ds[, c("player_id", "country_of_citizenship", "current_club_name", "current_

#mergedataframe
players_ds_merged <- merge(players_ds_personal, players_ds_club, by = "player_id")

head(players_ds_merged)
```

```
##   player_id first_name    last_name    country_of_birth country_of_citizenship
## 1        10   Miroslav        Klose              Poland                Germany
## 2        26      Roman Weidenfeller             Germany                Germany
## 3        65    Dimitar     Berbatov            Bulgaria               Bulgaria
## 4        77                     Lúcio              Brazil                 Brazil
## 5        80        Tom       Starke  East Germany (GDR)                Germany
## 6       109                     Dedê              Brazil                 Brazil
##                                     current_club_name
## 1                          Società Sportiva Lazio S.p.A.
## 2                                    Borussia Dortmund
## 3 Panthessalonikios Athlitikos Omilos Konstantinoupoliton
## 4                                Juventus Football Club
## 5                                    FC Bayern München
## 6                                        Eskisehirspor
##    current_club_domestic_competition_id
## 1                                   IT1
## 2                                    L1
## 3                                   GR1
## 4                                   IT1
## 5                                    L1
## 6                                   TR1
```

```r
#-----------------------------------------------------------------------------#

#Remove missing values in your dataset.
#remove players who do not have a market_value
players_ds_marketvalue <- players_ds %>% filter (!is.na(market_value_in_eur))
head(players_ds_marketvalue)
```

```
##   player_id first_name    last_name                name last_season
## 1        10   Miroslav        Klose      Miroslav Klose        2015
## 2        26      Roman Weidenfeller Roman Weidenfeller        2017
## 3        65    Dimitar     Berbatov   Dimitar Berbatov        2015
## 4        77                     Lúcio              Lúcio        2012
## 5        80        Tom       Starke        Tom Starke        2017
## 6       109                     Dedê               Dedê        2013
##    current_club_id     player_code   country_of_birth  city_of_birth
## 1              398   miroslav-klose             Poland          Opole
## 2               16 roman-weidenfeller            Germany           Diez
## 3             1091   dimitar-berbatov           Bulgaria     Blagoevgrad
## 4              506            lucio             Brazil        Brasília
## 5               27       tom-starke East Germany (GDR)         Freital
## 6              825             dede             Brazil Belo Horizonte
##    country_of_citizenship date_of_birth   sub_position   position  foot
```

```
## 1              Germany     1978-06-09 Centre-Forward     Attack right
## 2              Germany     1980-08-06     Goalkeeper Goalkeeper  left
## 3              Bulgaria    1981-01-30 Centre-Forward     Attack
## 4              Brazil      1978-05-08   Centre-Back   Defender
## 5              Germany     1981-03-18     Goalkeeper Goalkeeper right
## 6              Brazil      1978-04-18    Left-Back   Defender
##   height_in_cm contract_expiration_date           agent_name
## 1          184                         ASBW Sport Marketing
## 2          190                         Neubauer 13 GmbH
## 3           NA                          CSKA-AS-23 Ltd.
## 4           NA
## 5          194                                          IFM
## 6           NA                          Football Concept
##                                                                image_url
## 1  https://img.a.transfermarkt.technology/portrait/header/10-1448468291.jpg?lm=1
## 2  https://img.a.transfermarkt.technology/portrait/header/26-1502448725.jpg?lm=1
## 3  https://img.a.transfermarkt.technology/portrait/header/65-1683670068.jpg?lm=1
## 4  https://img.a.transfermarkt.technology/portrait/header/77-1458201664.jpg?lm=1
## 5  https://img.a.transfermarkt.technology/portrait/header/80-1471439914.JPG?lm=1
## 6 https://img.a.transfermarkt.technology/portrait/header/109-1487263703.jpg?lm=1
##                                                                url
## 1      https://www.transfermarkt.co.uk/miroslav-klose/profil/spieler/10
## 2 https://www.transfermarkt.co.uk/roman-weidenfeller/profil/spieler/26
## 3   https://www.transfermarkt.co.uk/dimitar-berbatov/profil/spieler/65
## 4            https://www.transfermarkt.co.uk/lucio/profil/spieler/77
## 5        https://www.transfermarkt.co.uk/tom-starke/profil/spieler/80
## 6            https://www.transfermarkt.co.uk/dede/profil/spieler/109
##   current_club_domestic_competition_id
## 1                                  IT1
## 2                                   L1
## 3                                  GR1
## 4                                  IT1
## 5                                   L1
## 6                                  TR1
##                                     current_club_name market_value_in_eur
## 1                       Società Sportiva Lazio S.p.A.             1000000
## 2                                   Borussia Dortmund              750000
## 3 Panthessalonikios Athlitikos Omilos Konstantinoupoliton           1000000
## 4                             Juventus Football Club              200000
## 5                                 FC Bayern München              100000
## 6                                     Eskisehirspor              400000
##   highest_market_value_in_eur
## 1                    30000000
## 2                     8000000
## 3                    34500000
## 4                    24500000
## 5                     3000000
## 6                     9500000
```

```r
#remove rows with ant missing values
players_ds_nonmissing <- na.omit(players_ds)
head(players_ds_nonmissing)
```

```
##    player_id first_name   last_name              name last_season
```

```
## 1        10    Miroslav       Klose    Miroslav Klose        2015
## 2        26      Roman  Weidenfeller Roman Weidenfeller       2017
## 5        80        Tom       Starke       Tom Starke          2017
## 8       132      Tomas      Rosicky    Tomas Rosicky          2015
## 9       162       Marc      Ziegler     Marc Ziegler          2012
## 10      215      Roque   Santa Cruz  Roque Santa Cruz         2015
##    current_club_id       player_code   country_of_birth city_of_birth
## 1             398    miroslav-klose             Poland        Opole
## 2              16 roman-weidenfeller            Germany         Diez
## 5              27         tom-starke East Germany (GDR)      Freital
## 8              11      tomas-rosicky               CSSR        Praha
## 9              79       marc-ziegler            Germany   Blieskastel
## 10           1084    roque-santa-cruz           Paraguay     Asunción
##    country_of_citizenship date_of_birth      sub_position   position  foot
## 1             Germany     1978-06-09    Centre-Forward      Attack right
## 2             Germany     1980-08-06        Goalkeeper  Goalkeeper  left
## 5             Germany     1981-03-18        Goalkeeper  Goalkeeper right
## 8       Czech Republic    1980-10-04 Attacking Midfield   Midfield  both
## 9             Germany     1976-06-13        Goalkeeper  Goalkeeper right
## 10           Paraguay     1981-08-16    Centre-Forward      Attack right
##    height_in_cm contract_expiration_date            agent_name
## 1           184                            ASBW Sport Marketing
## 2           190                            Neubauer 13 GmbH
## 5           194                                         IFM
## 8           179
## 9           193
## 10          193      2023-12-31 00:00:00
##                                                                  image_url
## 1   https://img.a.transfermarkt.technology/portrait/header/10-1448468291.jpg?lm=1
## 2   https://img.a.transfermarkt.technology/portrait/header/26-1502448725.jpg?lm=1
## 5   https://img.a.transfermarkt.technology/portrait/header/80-1471439914.JPG?lm=1
## 8   https://img.a.transfermarkt.technology/portrait/header/132-1464947592.jpg?lm=1
## 9  https://img.a.transfermarkt.technology/portrait/header/s_162_79_2012_1.jpg?lm=1
## 10  https://img.a.transfermarkt.technology/portrait/header/215-1564992591.png?lm=1
##                                                                        url
## 1      https://www.transfermarkt.co.uk/miroslav-klose/profil/spieler/10
## 2  https://www.transfermarkt.co.uk/roman-weidenfeller/profil/spieler/26
## 5          https://www.transfermarkt.co.uk/tom-starke/profil/spieler/80
## 8      https://www.transfermarkt.co.uk/tomas-rosicky/profil/spieler/132
## 9       https://www.transfermarkt.co.uk/marc-ziegler/profil/spieler/162
## 10  https://www.transfermarkt.co.uk/roque-santa-cruz/profil/spieler/215
##    current_club_domestic_competition_id
## 1                                    IT1
## 2                                     L1
## 5                                     L1
## 8                                    GB1
## 9                                     L1
## 10                                   ES1
##                        current_club_name market_value_in_eur
## 1          Società Sportiva Lazio S.p.A.             1000000
## 2                      Borussia Dortmund              750000
## 5                      FC Bayern München              100000
## 8                  Arsenal Football Club              350000
## 9  Verein für Bewegungsspiele Stuttgart 1893             200000
```

```
## 10                                    Málaga CF                     250000
##    highest_market_value_in_eur
## 1                    30000000
## 2                     8000000
## 5                     3000000
## 8                    17500000
## 9                     1250000
## 10                   12000000
```

```r
players_ds <- players_ds_nonmissing

#--------------------------------------------------------------------------------#

#Identify and remove duplicated data in your dataset

players_duplicates <- duplicated(players_ds)
no_of_duplicates <- sum(players_duplicates)
print(paste("No of duplicated rows ",no_of_duplicates))
```

```
## [1] "No of duplicated rows  0"
```

```r
players_ds_duplicates <- players_ds[players_duplicates,]
print(players_ds_duplicates)
```

```
##  [1] player_id                           first_name
##  [3] last_name                           name
##  [5] last_season                         current_club_id
##  [7] player_code                         country_of_birth
##  [9] city_of_birth                       country_of_citizenship
## [11] date_of_birth                       sub_position
## [13] position                            foot
## [15] height_in_cm                        contract_expiration_date
## [17] agent_name                          image_url
## [19] url                                 current_club_domestic_competition_id
## [21] current_club_name                   market_value_in_eur
## [23] highest_market_value_in_eur
## <0 rows> (or 0-length row.names)
```

```r
#remove duplicates
players_ds_unique1 <- players_ds[!players_duplicates,]
head(players_ds_unique1)
```

```
##     player_id first_name    last_name               name last_season
## 1          10   Miroslav        Klose      Miroslav Klose        2015
## 2          26      Roman  Weidenfeller Roman Weidenfeller        2017
## 5          80        Tom       Starke         Tom Starke        2017
## 8         132      Tomas      Rosicky      Tomas Rosicky        2015
## 9         162       Marc      Ziegler       Marc Ziegler        2012
## 10        215      Roque   Santa Cruz   Roque Santa Cruz        2015
##    current_club_id       player_code  country_of_birth city_of_birth
## 1              398     miroslav-klose           Poland         Opole
## 2               16 roman-weidenfeller          Germany          Diez
```

```
## 5               27        tom-starke East Germany (GDR)        Freital
## 8               11     tomas-rosicky                 CSSR        Praha
## 9               79     marc-ziegler             Germany  Blieskastel
## 10            1084  roque-santa-cruz             Paraguay     Asunción
##    country_of_citizenship date_of_birth     sub_position    position  foot
## 1                 Germany    1978-06-09    Centre-Forward      Attack right
## 2                 Germany    1980-08-06        Goalkeeper  Goalkeeper  left
## 5                 Germany    1981-03-18        Goalkeeper  Goalkeeper right
## 8          Czech Republic    1980-10-04 Attacking Midfield    Midfield  both
## 9                 Germany    1976-06-13        Goalkeeper  Goalkeeper right
## 10               Paraguay    1981-08-16    Centre-Forward      Attack right
##    height_in_cm contract_expiration_date           agent_name
## 1           184                          ASBW Sport Marketing
## 2           190                            Neubauer 13 GmbH
## 5           194                                         IFM
## 8           179
## 9           193
## 10          193     2023-12-31 00:00:00
##                                                                      image_url
## 1   https://img.a.transfermarkt.technology/portrait/header/10-1448468291.jpg?lm=1
## 2   https://img.a.transfermarkt.technology/portrait/header/26-1502448725.jpg?lm=1
## 5   https://img.a.transfermarkt.technology/portrait/header/80-1471439914.JPG?lm=1
## 8   https://img.a.transfermarkt.technology/portrait/header/132-1464947592.jpg?lm=1
## 9   https://img.a.transfermarkt.technology/portrait/header/s_162_79_2012_1.jpg?lm=1
## 10  https://img.a.transfermarkt.technology/portrait/header/215-1564992591.png?lm=1
##                                                                     url
## 1       https://www.transfermarkt.co.uk/miroslav-klose/profil/spieler/10
## 2     https://www.transfermarkt.co.uk/roman-weidenfeller/profil/spieler/26
## 5            https://www.transfermarkt.co.uk/tom-starke/profil/spieler/80
## 8        https://www.transfermarkt.co.uk/tomas-rosicky/profil/spieler/132
## 9         https://www.transfermarkt.co.uk/marc-ziegler/profil/spieler/162
## 10   https://www.transfermarkt.co.uk/roque-santa-cruz/profil/spieler/215
##    current_club_domestic_competition_id
## 1                                    IT1
## 2                                     L1
## 5                                     L1
## 8                                    GB1
## 9                                     L1
## 10                                   ES1
##                           current_club_name market_value_in_eur
## 1             Società Sportiva Lazio S.p.A.             1000000
## 2                        Borussia Dortmund              750000
## 5                       FC Bayern München              100000
## 8                     Arsenal Football Club              350000
## 9  Verein für Bewegungsspiele Stuttgart 1893             200000
## 10                              Málaga CF              250000
##    highest_market_value_in_eur
## 1                     30000000
## 2                      8000000
## 5                      3000000
## 8                     17500000
## 9                      1250000
## 10                    12000000
```

```
players_ds_unique2 <- unique(players_ds)
head(players_ds_unique2)
```

```
##      player_id first_name    last_name                name last_season
## 1          10    Miroslav        Klose       Miroslav Klose        2015
## 2          26       Roman  Weidenfeller  Roman Weidenfeller        2017
## 5          80         Tom        Starke          Tom Starke        2017
## 8         132       Tomas      Rosicky       Tomas Rosicky        2015
## 9         162        Marc      Ziegler         Marc Ziegler        2012
## 10        215       Roque  Santa Cruz     Roque Santa Cruz        2015
##      current_club_id        player_code      country_of_birth city_of_birth
## 1                398      miroslav-klose                Poland         Opole
## 2                 16 roman-weidenfeller               Germany          Diez
## 5                 27          tom-starke East Germany (GDR)        Freital
## 8                 11       tomas-rosicky                  CSSR         Praha
## 9                 79        marc-ziegler               Germany    Blieskastel
## 10              1084     roque-santa-cruz              Paraguay      Asunción
##      country_of_citizenship date_of_birth       sub_position   position  foot
## 1                   Germany    1978-06-09     Centre-Forward      Attack right
## 2                   Germany    1980-08-06         Goalkeeper  Goalkeeper  left
## 5                   Germany    1981-03-18         Goalkeeper  Goalkeeper right
## 8            Czech Republic    1980-10-04 Attacking Midfield    Midfield  both
## 9                   Germany    1976-06-13         Goalkeeper  Goalkeeper right
## 10                 Paraguay    1981-08-16     Centre-Forward      Attack right
##      height_in_cm contract_expiration_date          agent_name
## 1             184                          ASBW Sport Marketing
## 2             190                          Neubauer 13 GmbH
## 5             194                                           IFM
## 8             179
## 9             193
## 10            193      2023-12-31 00:00:00
##                                                                      image_url
## 1    https://img.a.transfermarkt.technology/portrait/header/10-1448468291.jpg?lm=1
## 2    https://img.a.transfermarkt.technology/portrait/header/26-1502448725.jpg?lm=1
## 5    https://img.a.transfermarkt.technology/portrait/header/80-1471439914.JPG?lm=1
## 8    https://img.a.transfermarkt.technology/portrait/header/132-1464947592.jpg?lm=1
## 9    https://img.a.transfermarkt.technology/portrait/header/s_162_79_2012_1.jpg?lm=1
## 10   https://img.a.transfermarkt.technology/portrait/header/215-1564992591.png?lm=1
##                                                                      url
## 1       https://www.transfermarkt.co.uk/miroslav-klose/profil/spieler/10
## 2     https://www.transfermarkt.co.uk/roman-weidenfeller/profil/spieler/26
## 5            https://www.transfermarkt.co.uk/tom-starke/profil/spieler/80
## 8        https://www.transfermarkt.co.uk/tomas-rosicky/profil/spieler/132
## 9         https://www.transfermarkt.co.uk/marc-ziegler/profil/spieler/162
## 10   https://www.transfermarkt.co.uk/roque-santa-cruz/profil/spieler/215
##      current_club_domestic_competition_id
## 1                                       IT1
## 2                                        L1
## 5                                        L1
## 8                                       GB1
## 9                                        L1
## 10                                       ES1
##                        current_club_name market_value_in_eur
```

```
## 1               Società Sportiva Lazio S.p.A.                    1000000
## 2                        Borussia Dortmund                        750000
## 5                        FC Bayern München                        100000
## 8                     Arsenal Football Club                        350000
## 9  Verein für Bewegungsspiele Stuttgart 1893                      200000
## 10                                 Málaga CF                       250000
##     highest_market_value_in_eur
## 1                      30000000
## 2                       8000000
## 5                       3000000
## 8                      17500000
## 9                       1250000
## 10                     12000000
```

```r
players_ds <- players_ds_unique1

#------------------------------------------------------------------------------#

#Reorder multiple rows in descending order

players_ds <- players_ds %>% arrange(desc(market_value_in_eur),desc(highest_market_value_in_eur))

head(players_ds)
```

```
##   player_id first_name       last_name             name last_season
## 1    342229     Kylian          Mbappé    Kylian Mbappé        2023
## 2    371998            Vinicius Junior Vinicius Junior        2023
## 3    418560     Erling         Haaland   Erling Haaland        2023
## 4    581678       Jude      Bellingham Jude Bellingham        2023
## 5    406635       Phil           Foden       Phil Foden        2023
## 6    433177     Bukayo            Saka      Bukayo Saka        2023
##   current_club_id    player_code country_of_birth city_of_birth
## 1             583  kylian-mbappe           France         Paris
## 2             418 vinicius-junior           Brazil    São Gonçalo
## 3             281  erling-haaland          England         Leeds
## 4             418 jude-bellingham          England    Stourbridge
## 5             281      phil-foden          England      Stockport
## 6              11     bukayo-saka          England         London
##   country_of_citizenship date_of_birth      sub_position position  foot
## 1                 France    1998-12-20   Centre-Forward    Attack right
## 2                 Brazil    2000-07-12      Left Winger    Attack right
## 3                 Norway    2000-07-21   Centre-Forward    Attack  left
## 4                England    2003-06-29 Attacking Midfield Midfield right
## 5                England    2000-05-28      Right Winger    Attack  left
## 6                England    2001-09-05      Right Winger    Attack  left
##   height_in_cm contract_expiration_date        agent_name
## 1          178       2024-06-30 00:00:00
## 2          176       2027-06-30 00:00:00 Roc Nation Sports
## 3          195       2027-06-30 00:00:00    Rafaela Pimenta
## 4          186       2029-06-30 00:00:00
## 5          171       2027-06-30 00:00:00
## 6          178       2027-06-30 00:00:00
##                                                                   image_url
## 1 https://img.a.transfermarkt.technology/portrait/header/342229-1682683695.jpg?lm=1
```

```
## 2 https://img.a.transfermarkt.technology/portrait/header/371998-1664869583.jpg?lm=1
## 3 https://img.a.transfermarkt.technology/portrait/header/418560-1709108116.png?lm=1
## 4 https://img.a.transfermarkt.technology/portrait/header/581678-1693987944.jpg?lm=1
## 5 https://img.a.transfermarkt.technology/portrait/header/406635-1668524492.jpg?lm=1
## 6 https://img.a.transfermarkt.technology/portrait/header/433177-1684155052.jpg?lm=1
##                                                                           url
## 1   https://www.transfermarkt.co.uk/kylian-mbappe/profil/spieler/342229
## 2 https://www.transfermarkt.co.uk/vinicius-junior/profil/spieler/371998
## 3  https://www.transfermarkt.co.uk/erling-haaland/profil/spieler/418560
## 4 https://www.transfermarkt.co.uk/jude-bellingham/profil/spieler/581678
## 5       https://www.transfermarkt.co.uk/phil-foden/profil/spieler/406635
## 6      https://www.transfermarkt.co.uk/bukayo-saka/profil/spieler/433177
##    current_club_domestic_competition_id              current_club_name
## 1                                   FR1 Paris Saint-Germain Football Club
## 2                                   ES1        Real Madrid Club de Fútbol
## 3                                   GB1     Manchester City Football Club
## 4                                   ES1        Real Madrid Club de Fútbol
## 5                                   GB1     Manchester City Football Club
## 6                                   GB1             Arsenal Football Club
##    market_value_in_eur highest_market_value_in_eur
## 1            180000000                   200000000
## 2            180000000                   180000000
## 3            180000000                   180000000
## 4            180000000                   180000000
## 5            150000000                   150000000
## 6            140000000                   140000000
```

```r
#---------------------------------------------------------------------------------#

#Rename some of the column names in your dataset

players_ds <- players_ds %>% rename ( full_name = name , birth_city = city_of_birth , preferred_foot =

head(players_ds)
```

```
##    player_id first_name       last_name        full_name last_season
## 1    342229      Kylian          Mbappé    Kylian Mbappé        2023
## 2    371998             Vinicius Junior Vinicius Junior        2023
## 3    418560      Erling          Haaland  Erling Haaland        2023
## 4    581678        Jude      Bellingham Jude Bellingham        2023
## 5    406635        Phil            Foden      Phil Foden        2023
## 6    433177      Bukayo            Saka     Bukayo Saka        2023
##    current_club_id     player_code country_of_birth  birth_city
## 1             583   kylian-mbappe           France       Paris
## 2             418 vinicius-junior           Brazil São Gonçalo
## 3             281  erling-haaland          England        Leeds
## 4             418 jude-bellingham          England Stourbridge
## 5             281      phil-foden          England    Stockport
## 6              11     bukayo-saka          England      London
##    country_of_citizenship date_of_birth    sub_position position
## 1                  France    1998-12-20    Centre-Forward   Attack
## 2                  Brazil    2000-07-12      Left Winger   Attack
## 3                  Norway    2000-07-21    Centre-Forward   Attack
## 4                 England    2003-06-29 Attacking Midfield Midfield
```

```
## 5                     England    2000-05-28        Right Winger    Attack
## 6                     England    2001-09-05        Right Winger    Attack
##   preferred_foot height_in_cm contract_expiration_date        agent_name
## 1         right          178        2024-06-30 00:00:00
## 2         right          176        2027-06-30 00:00:00 Roc Nation Sports
## 3          left          195        2027-06-30 00:00:00   Rafaela Pimenta
## 4         right          186        2029-06-30 00:00:00
## 5          left          171        2027-06-30 00:00:00
## 6          left          178        2027-06-30 00:00:00
##                                                             image_url
## 1 https://img.a.transfermarkt.technology/portrait/header/342229-1682683695.jpg?lm=1
## 2 https://img.a.transfermarkt.technology/portrait/header/371998-1664869583.jpg?lm=1
## 3 https://img.a.transfermarkt.technology/portrait/header/418560-1709108116.png?lm=1
## 4 https://img.a.transfermarkt.technology/portrait/header/581678-1693987944.jpg?lm=1
## 5 https://img.a.transfermarkt.technology/portrait/header/406635-1668524492.jpg?lm=1
## 6 https://img.a.transfermarkt.technology/portrait/header/433177-1684155052.jpg?lm=1
##                                                             url
## 1   https://www.transfermarkt.co.uk/kylian-mbappe/profil/spieler/342229
## 2 https://www.transfermarkt.co.uk/vinicius-junior/profil/spieler/371998
## 3  https://www.transfermarkt.co.uk/erling-haaland/profil/spieler/418560
## 4 https://www.transfermarkt.co.uk/jude-bellingham/profil/spieler/581678
## 5      https://www.transfermarkt.co.uk/phil-foden/profil/spieler/406635
## 6      https://www.transfermarkt.co.uk/bukayo-saka/profil/spieler/433177
##   current_club_domestic_competition_id              current_club_name
## 1                                  FR1 Paris Saint-Germain Football Club
## 2                                  ES1         Real Madrid Club de Fútbol
## 3                                  GB1      Manchester City Football Club
## 4                                  ES1         Real Madrid Club de Fútbol
## 5                                  GB1      Manchester City Football Club
## 6                                  GB1             Arsenal Football Club
##   market_value_in_eur highest_market_value_in_eur
## 1         180000000                   200000000
## 2         180000000                   180000000
## 3         180000000                   180000000
## 4         180000000                   180000000
## 5         150000000                   150000000
## 6         140000000                   140000000
```

```r
#-------------------------------------------------------------------------------#

#Add new variables in your data frame by using a mathematical function (for e.g. - multiply an existing

players_ds <- players_ds %>% mutate (market_value_doubled = market_value_in_eur * 2)

head(players_ds)
```

```
##   player_id first_name       last_name        full_name last_season
## 1    342229     Kylian          Mbappé    Kylian Mbappé        2023
## 2    371998            Vinicius Junior Vinicius Junior        2023
## 3    418560     Erling          Haaland  Erling Haaland        2023
## 4    581678       Jude       Bellingham Jude Bellingham        2023
## 5    406635       Phil            Foden      Phil Foden        2023
## 6    433177     Bukayo            Saka     Bukayo Saka        2023
##   current_club_id    player_code country_of_birth  birth_city
```

```
## 1             583     kylian-mbappe        France      Paris
## 2             418  vinicius-junior       Brazil São Gonçalo
## 3             281   erling-haaland      England       Leeds
## 4             418  jude-bellingham      England Stourbridge
## 5             281      phil-foden       England   Stockport
## 6              11      bukayo-saka      England      London
##   country_of_citizenship date_of_birth        sub_position position
## 1                 France    1998-12-20    Centre-Forward   Attack
## 2                 Brazil    2000-07-12       Left Winger   Attack
## 3                 Norway    2000-07-21    Centre-Forward   Attack
## 4                England    2003-06-29 Attacking Midfield Midfield
## 5                England    2000-05-28      Right Winger   Attack
## 6                England    2001-09-05      Right Winger   Attack
##   preferred_foot height_in_cm contract_expiration_date        agent_name
## 1          right          178      2024-06-30 00:00:00
## 2          right          176      2027-06-30 00:00:00 Roc Nation Sports
## 3           left          195      2027-06-30 00:00:00   Rafaela Pimenta
## 4          right          186      2029-06-30 00:00:00
## 5           left          171      2027-06-30 00:00:00
## 6           left          178      2027-06-30 00:00:00
##                                                                      image_url
## 1 https://img.a.transfermarkt.technology/portrait/header/342229-1682683695.jpg?lm=1
## 2 https://img.a.transfermarkt.technology/portrait/header/371998-1664869583.jpg?lm=1
## 3 https://img.a.transfermarkt.technology/portrait/header/418560-1709108116.png?lm=1
## 4 https://img.a.transfermarkt.technology/portrait/header/581678-1693987944.jpg?lm=1
## 5 https://img.a.transfermarkt.technology/portrait/header/406635-1668524492.jpg?lm=1
## 6 https://img.a.transfermarkt.technology/portrait/header/433177-1684155052.jpg?lm=1
##                                                                      url
## 1   https://www.transfermarkt.co.uk/kylian-mbappe/profil/spieler/342229
## 2 https://www.transfermarkt.co.uk/vinicius-junior/profil/spieler/371998
## 3  https://www.transfermarkt.co.uk/erling-haaland/profil/spieler/418560
## 4 https://www.transfermarkt.co.uk/jude-bellingham/profil/spieler/581678
## 5      https://www.transfermarkt.co.uk/phil-foden/profil/spieler/406635
## 6     https://www.transfermarkt.co.uk/bukayo-saka/profil/spieler/433177
##   current_club_domestic_competition_id             current_club_name
## 1                                  FR1 Paris Saint-Germain Football Club
## 2                                  ES1         Real Madrid Club de Fútbol
## 3                                  GB1      Manchester City Football Club
## 4                                  ES1         Real Madrid Club de Fútbol
## 5                                  GB1      Manchester City Football Club
## 6                                  GB1             Arsenal Football Club
##   market_value_in_eur highest_market_value_in_eur market_value_doubled
## 1           180000000                   200000000              3.6e+08
## 2           180000000                   180000000              3.6e+08
## 3           180000000                   180000000              3.6e+08
## 4           180000000                   180000000              3.6e+08
## 5           150000000                   150000000              3.0e+08
## 6           140000000                   140000000              2.8e+08
```

```r
#---------------------------------------------------------------------------#

#Create a training set using random number generator engine.

set.seed(513)
```

```r
# Number of rows in the dataset
print(paste("Total no. of rows:",nrow(players_ds)))
```

```
## [1] "Total no. of rows: 27803"
```

```r
train_indices <- sample(nrow(players_ds), size = 0.7 * nrow(players_ds), replace = FALSE)

training_set <- players_ds[train_indices, ]

print(paste("Training set rows",nrow(training_set)))
```

```
## [1] "Training set rows 19462"
```

```r
head(training_set)
```

```
##       player_id first_name  last_name        full_name last_season
## 20151     65464       Alex     Cooper      Alex Cooper        2013
## 10634    230937            Fernandinho      Fernandinho        2014
## 18623     36007     Zeljko   Kalajdzic  Zeljko Kalajdzic        2014
## 20934    206701      Mario Piccinocchi Mario Piccinocchi        2014
## 8688     442816       Fran      Gámez       Fran Gámez        2019
## 23038    821730     Manuel      Baldé     Manuel Baldé        2022
##       current_club_id    player_code country_of_birth       birth_city
## 20151            2759    alex-cooper          Scotland        Inverness
## 10634            1465    fernandinho            Brazil          Limeira
## 18623             653 zeljko-kalajdzic Jugoslawien (SFR)          Belgrad
## 20934               5 mario-piccinocchi            Italy           Milano
## 8688              237     fran-gamez            Spain Puerto de Sagunto
## 23038            6912    manuel-balde          Portugal        Albufeira
##       country_of_citizenship date_of_birth      sub_position   position
## 20151               Scotland    1991-11-04         Left-Back   Defender
## 10634                 Brazil    1993-03-16      Right Winger     Attack
## 18623                 Serbia    1978-05-11   Central Midfield   Midfield
## 20934                  Italy    1995-02-21 Defensive Midfield   Midfield
## 8688                   Spain    1991-07-27        Right-Back   Defender
## 23038          Guinea-Bissau    2002-11-14        Goalkeeper Goalkeeper
##       preferred_foot height_in_cm contract_expiration_date      agent_name
## 20151           left          180      2025-06-30 00:00:00 LATNORD Football
## 10634           left          174      2024-12-31 00:00:00    RJ Assessoria
## 18623           both          176
## 20934          right          172      2023-06-30 00:00:00
## 8688           right          174      2023-06-30 00:00:00     PROTIO SPORT
## 23038          right          194      2026-06-30 00:00:00
##                                                                        image_url
## 20151  https://img.a.transfermarkt.technology/portrait/header/65464-1561152957.jpg?lm=1
## 10634 https://img.a.transfermarkt.technology/portrait/header/230937-1566569723.jpg?lm=1
## 18623          https://img.a.transfermarkt.technology/portrait/header/default.jpg?lm=1
## 20934 https://img.a.transfermarkt.technology/portrait/header/206701-1448450677.jpg?lm=1
## 8688   https://img.a.transfermarkt.technology/portrait/header/442816-1583331930.jpg?lm=1
## 23038          https://img.a.transfermarkt.technology/portrait/header/default.jpg?lm=1
##                                                                              url
```

```
## 20151           https://www.transfermarkt.co.uk/alex-cooper/profil/spieler/65464
## 10634          https://www.transfermarkt.co.uk/fernandinho/profil/spieler/230937
## 18623   https://www.transfermarkt.co.uk/zeljko-kalajdzic/profil/spieler/36007
## 20934 https://www.transfermarkt.co.uk/mario-piccinocchi/profil/spieler/206701
## 8688           https://www.transfermarkt.co.uk/fran-gamez/profil/spieler/442816
## 23038         https://www.transfermarkt.co.uk/manuel-balde/profil/spieler/821730
##       current_club_domestic_competition_id                 current_club_name
## 20151                                  SC1          Ross County Football Club
## 10634                                  PO1      Grupo Desportivo Estoril Praia
## 18623                                  GR1         Omilos Filathlon Irakliou FC
## 20934                                  IT1          Associazione Calcio Milan
## 8688                                   ES1 Real Club Deportivo Mallorca S.A.D.
## 23038                                  PO1            Futebol Clube de Vizela
##       market_value_in_eur highest_market_value_in_eur market_value_doubled
## 20151              125000                      225000               250000
## 10634              350000                     2700000               700000
## 18623              150000                      500000               300000
## 20934              100000                     1750000               200000
## 8688               500000                      800000              1000000
## 23038              100000                      100000               200000
```

```
#-------------------------------------------------------------------------------#
```

```
#Print the summary statistics of your dataset
```

```
summary(players_ds)
```

```
##    player_id          first_name          last_name           full_name
## Min.   :     10   Length:27803       Length:27803       Length:27803
## 1st Qu.:  89571   Class :character   Class :character   Class :character
## Median : 241700   Mode  :character   Mode  :character   Mode  :character
## Mean   : 293392
## 3rd Qu.: 435493
## Max.   :1240467
##  last_season    current_club_id player_code        country_of_birth
## Min.   :2012   Min.   :    3   Length:27803       Length:27803
## 1st Qu.:2016   1st Qu.:  403   Class :character   Class :character
## Median :2020   Median : 1082   Mode  :character   Mode  :character
## Mean   :2019   Mean   : 4440
## 3rd Qu.:2022   3rd Qu.: 3057
## Max.   :2023   Max.   :83678
##  birth_city        country_of_citizenship date_of_birth
## Length:27803       Length:27803           Length:27803
## Class :character   Class :character       Class :character
## Mode  :character   Mode  :character       Mode  :character
##
##
##
##  sub_position         position         preferred_foot      height_in_cm
## Length:27803       Length:27803       Length:27803       Min.   : 18.0
## Class :character   Class :character   Class :character   1st Qu.:178.0
## Mode  :character   Mode  :character   Mode  :character   Median :183.0
##                                                          Mean   :182.3
##                                                          3rd Qu.:187.0
```

```
##                                                               Max.    :207.0
## contract_expiration_date  agent_name           image_url
## Length:27803              Length:27803         Length:27803
## Class :character          Class :character     Class :character
## Mode  :character          Mode  :character     Mode  :character
##
##
##
##       url               current_club_domestic_competition_id current_club_name
## Length:27803             Length:27803                         Length:27803
## Class :character   Class :character                           Class :character
## Mode  :character   Mode  :character                           Mode  :character
##
##
##
## market_value_in_eur highest_market_value_in_eur market_value_doubled
## Min.   :   10000    Min.   :   10000            Min.   :   20000
## 1st Qu.:  100000    1st Qu.:  300000            1st Qu.:  200000
## Median :  250000    Median :  800000            Median :  500000
## Mean   : 1696715    Mean   : 3919282            Mean   : 3393429
## 3rd Qu.:  700000    3rd Qu.: 3000000            3rd Qu.: 1400000
## Max.   :180000000   Max.   :200000000           Max.   :360000000
```

```r
#--------------------------------------------------------------------------------#

#Use any of the numerical variables from the dataset and perform the following statistical functions

#Mean
mean_market_value <- mean(players_ds$market_value_in_eur)
print(paste("The mean value of the market values is ",mean_market_value))
```

```
## [1] "The mean value of the market values is  1696714.56317664"
```

```r
#Median
median_market_value <- median(players_ds$market_value_in_eur)
print(paste("The median value of the market values is ", median_market_value))
```

```
## [1] "The median value of the market values is  250000"
```

```r
#Mode
mode_market_value <- Mode(players_ds$market_value_in_eur)
print(paste("The mode of the market values is ",mode_market_value))
```

```
## [1] "The mode of the market values is  100000"
```

```r
#Range

range_market_value <- range(players_ds$market_value_in_eur)
print(paste("The range of the market values is [", range_market_value[1], " - ", range_market_value[2],
```

```
## [1] "The range of the market values is [ 10000  -  180000000 ]"
```

```
#----------------------------------------------------------------------------------#

#Plot a scatter plot for any 2 variables in your dataset

## Aggregate the data
scatter_aggregated_data <- players_ds %>%
  group_by(current_club_domestic_competition_id, position) %>%
  summarise(player_count = n())
```
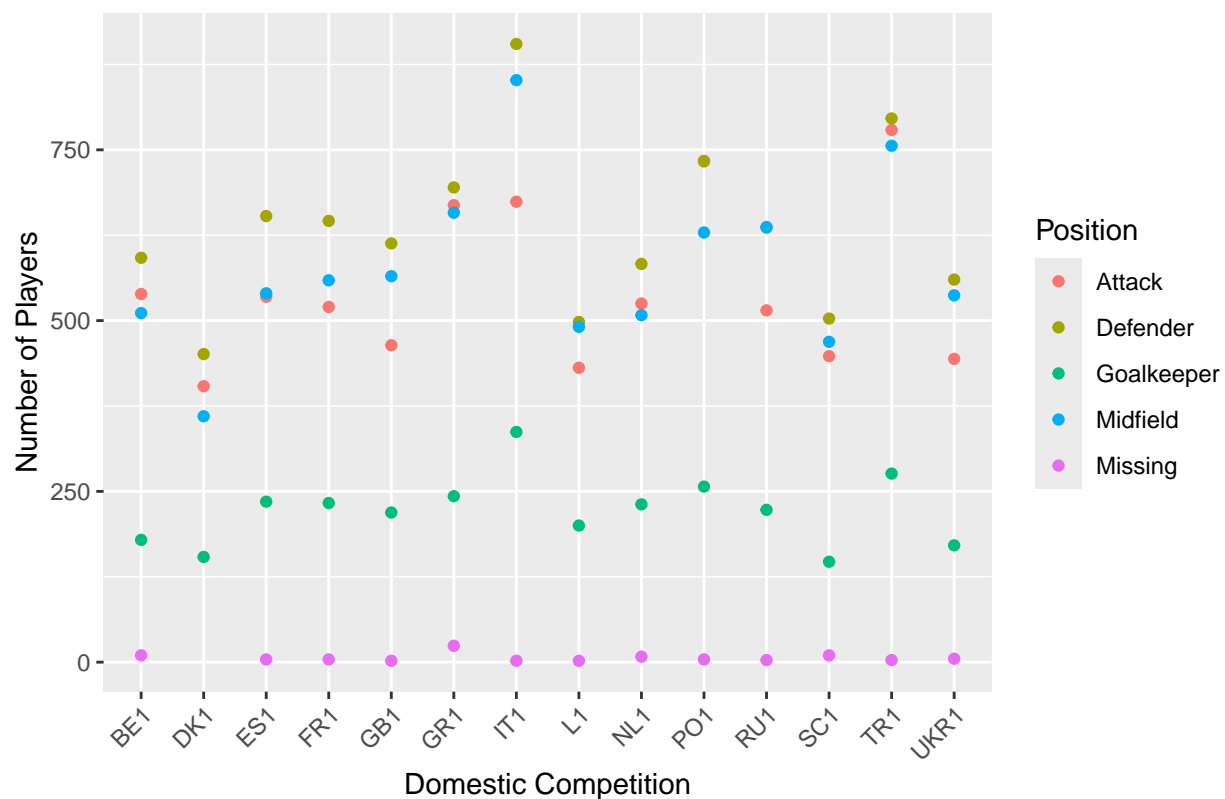
```
## `summarise()` has grouped output by 'current_club_domestic_competition_id'. You
## can override using the `.groups` argument.
```

```
ggplot(scatter_aggregated_data, aes(x = current_club_domestic_competition_id, y = player_count, colour =
  geom_point() +
  labs(title = "Number of Players in Each Position in each Domestic Competition",
       x = "Domestic Competition",
       y = "Number of Players",
       color = "Position")  +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```


Number of Players in Each Position in each Domestic Competition

```
#----------------------------------------------------------------------------------#

#Plot a bar plot for any 2 variables in your dataset
```
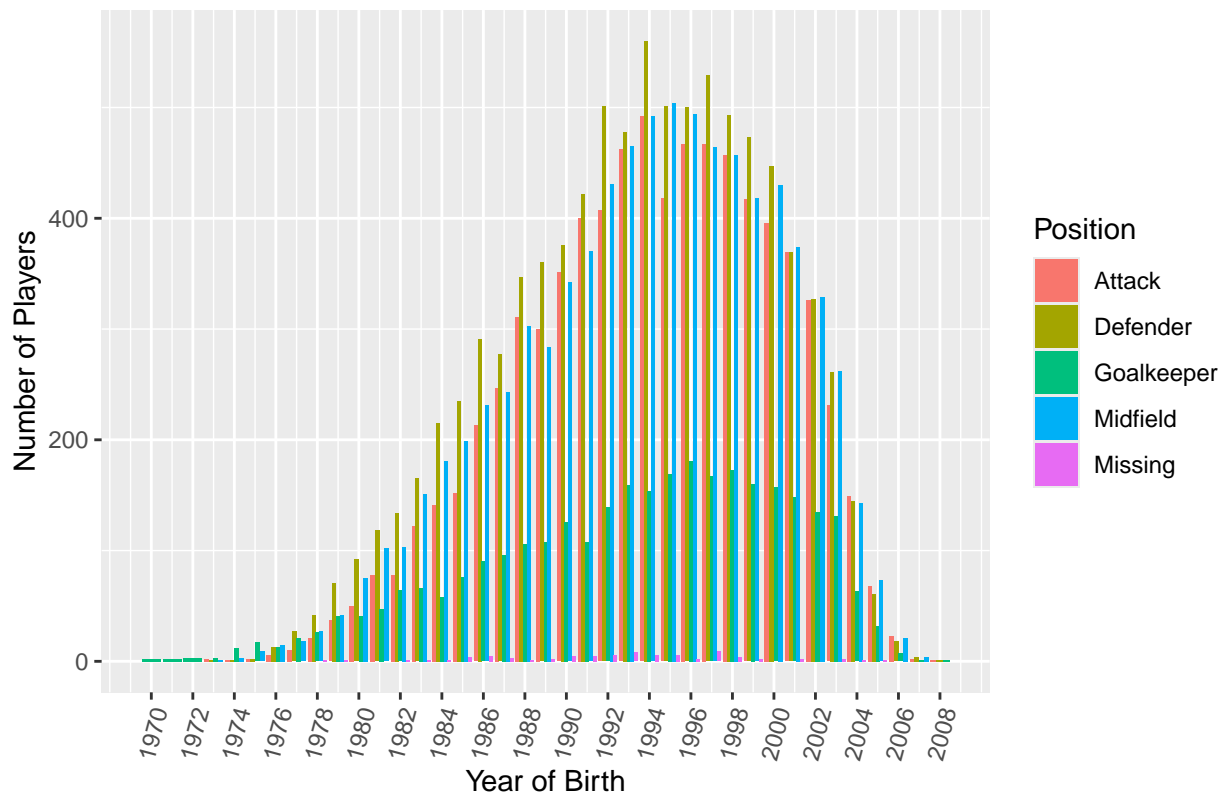
```
# Extract the year of birth from the date_of_birth column
players_ds <- players_ds %>%
  mutate(year_of_birth = year(as.Date(date_of_birth)))

# Aggregate the data
aggregated_data <- players_ds %>%
  group_by(year_of_birth, position) %>%
  summarise(player_count = n())
```

`summarise()` has grouped output by 'year_of_birth'. You can override using the
`.groups` argument.

```
aggregated_data<-na.omit(aggregated_data)
ggplot(aggregated_data, aes(x = year_of_birth, y = player_count, fill = position)) +
  geom_bar(stat = "identity", position = "dodge") +
  labs(title = "Number of Players in Each Position by Year of Birth",
       x = "Year of Birth",
       y = "Number of Players",
       fill = "Position") +
  scale_x_continuous(breaks = seq(min(aggregated_data$year_of_birth), max(aggregated_data$year_of_birth
  theme(axis.text.x = element_text(angle = 75, hjust = 1))
```


Number of Players in Each Position by Year of Birth

```r
# Calculate Pearson correlation coefficient
# Calculate the Pearson correlation between market_value and highest_market_value

correlation <- cor(players_ds$market_value_in_eur, players_ds$highest_market_value_in_eur, method = "pea

print(paste("The correlation coefficient is", correlation))
```

```
## [1] "The correlation coefficient is 0.782166725387313"
```

```r
#------------------------------------------------------------------------------#
```