R Assignment

Group 1

2024-06-14

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


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
```

```
library(dplyr)
library(DescTools)
library(ggplot2)
library(scales)
```

```
##
## Attaching package: 'scales'
##
## The following object is masked from 'package:purrr':
##
##     discard
##
## The following object is masked from 'package:readr':
##
##     col_factor
```

```
#--------------------------------------------------------------------------------#
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  "09-06-1978" "06-08-1980" "30-01-1981" "08-05-1978" ..
##  $ 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/header
##  $ 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
```

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

# 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"
```

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

# 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    09-06-1978      Centre-Forward      Attack  right
## 2                 Germany    06-08-1980          Goalkeeper  Goalkeeper   left
## 3                Bulgaria    30-01-1981      Centre-Forward      Attack
## 4                  Brazil    08-05-1978         Centre-Back    Defender
## 5                 Germany    18-03-1981          Goalkeeper  Goalkeeper  right
## 6                  Brazil    18-04-1978           Left-Back    Defender
## 7                 Germany    05-11-1980         Centre-Back    Defender
## 8          Czech Republic    04-10-1980  Attacking Midfield    Midfield   both
## 9                 Germany    13-06-1976          Goalkeeper  Goalkeeper  right
## 10               Paraguay    16-08-1981      Centre-Forward      Attack  right
## 11                Germany    03-10-1978      Centre-Forward      Attack  right
## 12                Hungary    15-03-1981  Attacking Midfield    Midfield   both
## 13                Denmark    15-04-1982         Centre-Back    Defender
## 14                Germany    16-10-1980    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          31-12-2023 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
```

```
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      09-06-1978   Centre-Forward     Attack  right
## 2              Germany      06-08-1980       Goalkeeper Goalkeeper   left
## 3              Bulgaria     30-01-1981   Centre-Forward     Attack
## 4               Brazil      08-05-1978     Centre-Back   Defender
## 5              Germany      18-03-1981       Goalkeeper Goalkeeper  right
## 6               Brazil      18-04-1978       Left-Back   Defender
## 7              Germany      05-11-1980     Centre-Back   Defender
## 8        Czech Republic     04-10-1980 Attacking Midfield   Midfield  both
## 9              Germany      13-06-1976       Goalkeeper Goalkeeper  right
## 10             Paraguay     16-08-1981   Centre-Forward     Attack  right
## 11             Germany      03-10-1978   Centre-Forward     Attack  right
## 12             Hungary      15-03-1981 Attacking Midfield   Midfield  both
## 13             Denmark      15-04-1982     Centre-Back   Defender
## 14             Germany      16-10-1980   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          31-12-2023 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
#--------------------------------------------------------------------------------#

# Write a user defined function using any of the variables from the data set.

# Function to return the no of players having market value greater 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"
```

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

#Use data manipulation techniques and filter rows based on any logical criteria that exist in your data
```

```r
#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"
```

```r
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    18-04-1990     Goalkeeper Goalkeeper right          196
## 2    08-08-1991    Centre-Back    Defender right          195
## 3    13-05-1993 Centre-Forward      Attack  left          191
## 4    02-10-1992     Goalkeeper Goalkeeper right          193
## 5    11-05-1992     Goalkeeper Goalkeeper  left          200
## 6    07-12-1991 Centre-Forward      Attack right          191
##   contract_expiration_date          agent_name
## 1         30-06-2025 00:00          CAA Stellar
## 2         30-06-2024 00:00 ASBW Sport Marketing
## 3         30-06-2024 00:00          TEAM LUKAKU
## 4         30-06-2027 00:00
## 5         30-06-2026 00:00  Christophe Henrotay
## 6         30-06-2024 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


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_

#merge dataframe
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
```

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

#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    09-06-1978 Centre-Forward     Attack  right
## 2                Germany    06-08-1980     Goalkeeper Goalkeeper   left
## 3               Bulgaria    30-01-1981 Centre-Forward     Attack
## 4                 Brazil    08-05-1978    Centre-Back   Defender
## 5                Germany    18-03-1981     Goalkeeper Goalkeeper  right
## 6                 Brazil    18-04-1978      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    09-06-1978     Centre-Forward      Attack right
## 2                 Germany    06-08-1980         Goalkeeper  Goalkeeper  left
## 5                 Germany    18-03-1981         Goalkeeper  Goalkeeper right
## 8          Czech Republic    04-10-1980 Attacking Midfield    Midfield  both
## 9                 Germany    13-06-1976         Goalkeeper  Goalkeeper right
## 10               Paraguay    16-08-1981     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          31-12-2023 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)
```

```
#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    09-06-1978     Centre-Forward      Attack right
## 2                  Germany    06-08-1980        Goalkeeper  Goalkeeper  left
## 5                  Germany    18-03-1981        Goalkeeper  Goalkeeper right
## 8           Czech Republic    04-10-1980 Attacking Midfield    Midfield  both
## 9                  Germany    13-06-1976        Goalkeeper  Goalkeeper right
## 10                Paraguay    16-08-1981     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          31-12-2023 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_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    09-06-1978    Centre-Forward      Attack right
## 2                 Germany    06-08-1980        Goalkeeper  Goalkeeper  left
## 5                 Germany    18-03-1981        Goalkeeper  Goalkeeper right
## 8          Czech Republic    04-10-1980 Attacking Midfield    Midfield  both
## 9                 Germany    13-06-1976        Goalkeeper  Goalkeeper right
## 10               Paraguay    16-08-1981    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          31-12-2023 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    20-12-1998   Centre-Forward   Attack right
```

```
## 2                    Brazil     12-07-2000       Left Winger   Attack right
## 3                    Norway     21-07-2000    Centre-Forward   Attack  left
## 4                   England     29-06-2003 Attacking Midfield Midfield right
## 5                   England     28-05-2000      Right Winger   Attack  left
## 6                   England     05-09-2001      Right Winger   Attack  left
##   height_in_cm contract_expiration_date        agent_name
## 1          178         30-06-2024 00:00
## 2          176         30-06-2027 00:00 Roc Nation Sports
## 3          195         30-06-2027 00:00   Rafaela Pimenta
## 4          186         30-06-2029 00:00
## 5          171         30-06-2027 00:00
## 6          178         30-06-2027 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    20-12-1998     Centre-Forward   Attack
## 2                 Brazil    12-07-2000       Left Winger    Attack
## 3                 Norway    21-07-2000     Centre-Forward   Attack
## 4                England    29-06-2003 Attacking Midfield Midfield
## 5                England    28-05-2000      Right Winger    Attack
## 6                England    05-09-2001      Right Winger    Attack
##   preferred_foot height_in_cm contract_expiration_date       agent_name
## 1          right          178        30-06-2024 00:00
## 2          right          176        30-06-2027 00:00 Roc Nation Sports
## 3           left          195        30-06-2027 00:00   Rafaela Pimenta
## 4          right          186        30-06-2029 00:00
## 5           left          171        30-06-2027 00:00
## 6           left          178        30-06-2027 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    20-12-1998     Centre-Forward   Attack
## 2                 Brazil    12-07-2000       Left Winger   Attack
## 3                 Norway    21-07-2000     Centre-Forward   Attack
## 4                England    29-06-2003 Attacking Midfield Midfield
## 5                England    28-05-2000       Right Winger   Attack
## 6                England    05-09-2001       Right Winger   Attack
##   preferred_foot height_in_cm contract_expiration_date       agent_name
## 1          right          178        30-06-2024 00:00
## 2          right          176        30-06-2027 00:00 Roc Nation Sports
## 3           left          195        30-06-2027 00:00   Rafaela Pimenta
## 4          right          186        30-06-2029 00:00
## 5           left          171        30-06-2027 00:00
## 6           left          178        30-06-2027 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)

# 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    04-11-1991        Left-Back   Defender
## 10634                 Brazil    16-03-1993     Right Winger     Attack
## 18623                 Serbia    11-05-1978  Central Midfield   Midfield
## 20934                  Italy    21-02-1995 Defensive Midfield  Midfield
## 8688                   Spain    27-07-1991       Right-Back   Defender
## 23038          Guinea-Bissau    14-11-2002        Goalkeeper Goalkeeper
```

```
##       preferred_foot height_in_cm contract_expiration_date      agent_name
## 20151          left          180        30-06-2025 00:00 LATNORD Football
## 10634          left          174        31-12-2024 00:00    RJ Assessoria
## 18623          both          176
## 20934         right          172        30-06-2023 00:00
## 8688          right          174        30-06-2023 00:00     PROTIO SPORT
## 23038         right          194        30-06-2026 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.   :159.0
##  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 ]"
```
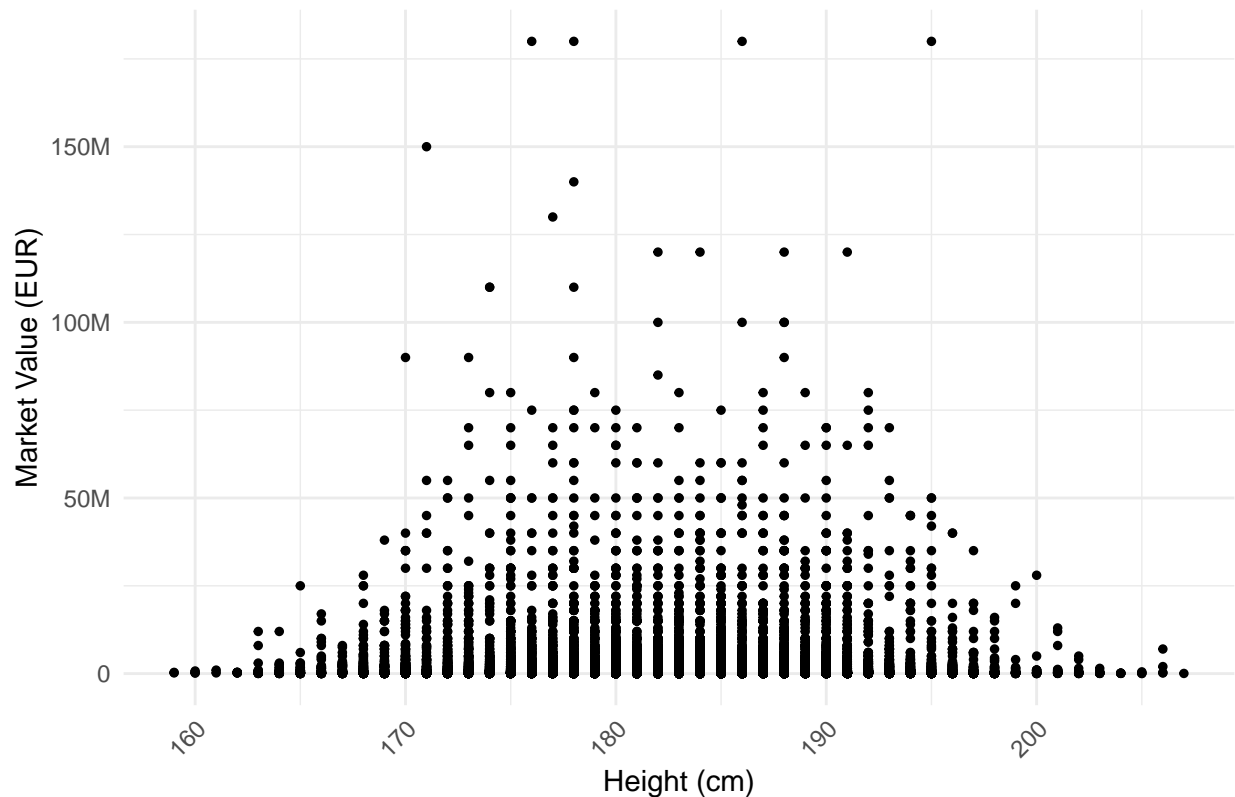
```r
#-------------------------------------------------------------------------------------#

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

#Plot graph market value vs height
ggplot(players_ds, aes(x = height_in_cm, y = market_value_in_eur)) +
  geom_point(color = "black", size = 1) +          # Points for players
  labs(title = "Market Value vs. Height of Football Players",
       x = "Height (cm)",
       y = "Market Value (EUR)") +
  scale_y_continuous(labels = label_number(scale_cut = cut_short_scale())) + # Format y-axis labels
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Market Value vs. Height of Football Players


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

#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.

```
# Remove empty values
aggregated_data<-na.omit(aggregated_data)

#Plot the graph No of players vs Year of Birth
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",
```
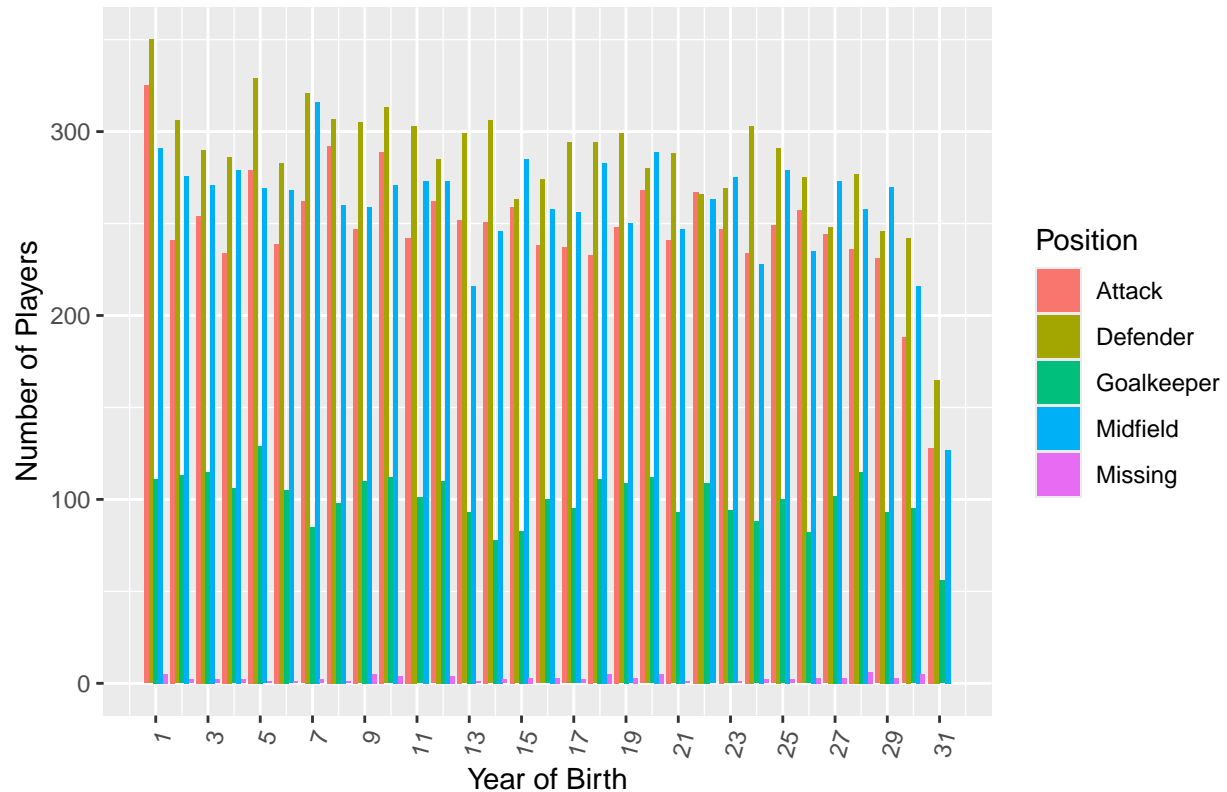
```
        fill = "Position") +
  scale_x_continuous(breaks = seq(min(aggregated_data$year_of_birth), max(aggregated_data$year_of_birth
  theme(axis.text.x = element_text(angle = 75, hjust = 1))
```

Number of Players in Each Position by Year of Birth


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


# 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 = "pe

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


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

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