****

Part 1

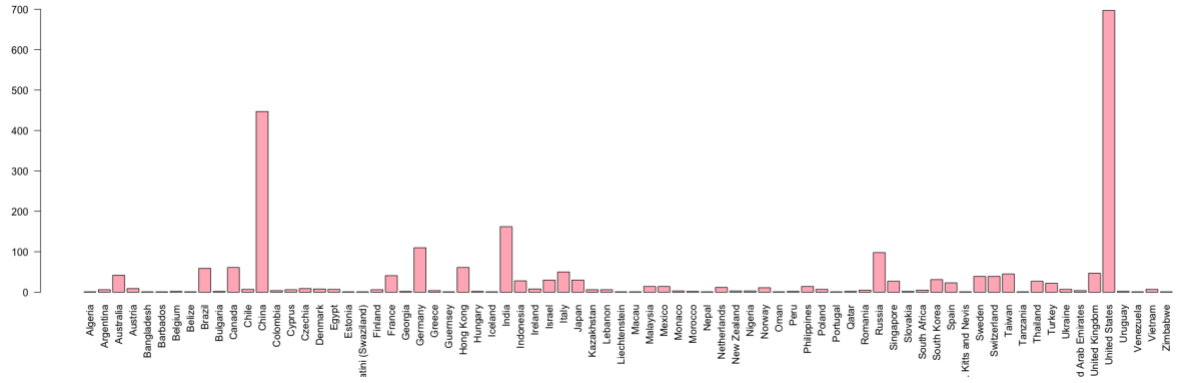
Code part:a

```
forbes <- read.csv("https://people.bu.edu/kalathur/datasets/forbes.csv")
#a)
#using table function to calculaate the frequency by country
freq_country <- table(forbes$country)
max_val <- max(freq_country)
par(mar=c(7,4,2,2))
barplot(freq_country,col = "lightpink",las =2,ylim=c(0,max_val))
```

Console section:

```
forbes <- read.csv("https://people.bu.edu/kalathur/datasets/forbes.csv")
> #a)
> #using table function to calculaate the frequency by country.
> freq_country <- table(forbes$country)
> m <- max(freq_country)
> par(mar=c(7,4,2,2))
> barplot(freq_country,col = "lightpink",las =2, ylim=c(0,700))
```

Plot:a



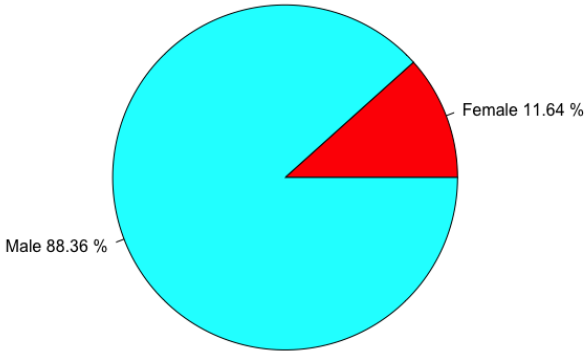
Code section:b

```
freq_gender <- table(forbes$gender)
slices <- c(freq_gender[1]/sum(freq_gender),freq_gender[2]/sum(freq_gender))
lbls <- c("Female","Male")
pct <- round(slices*100,2)
lbls <- paste(lbls,pct,"%")
lbsl <- paste(lbls,"%", sep = "")
pie(slices,labels = lbls,col = rainbow(2))
```

console section:b

```
> freq_gender <- table(forbes$gender)
> slices <- c(freq_gender[1]/sum(freq_gender),freq_gender[2]/sum(freq_gender))
> lbls <- c("Female","Male")
> pct <- round(slices*100,2)
> lbls <- paste(lbls,pct,"%")
> lbsl <- paste(lbls,"%", sep = "")
> pie(slices,labels = lbls,col = rainbow(2))
```

Plot:a



Code section:c

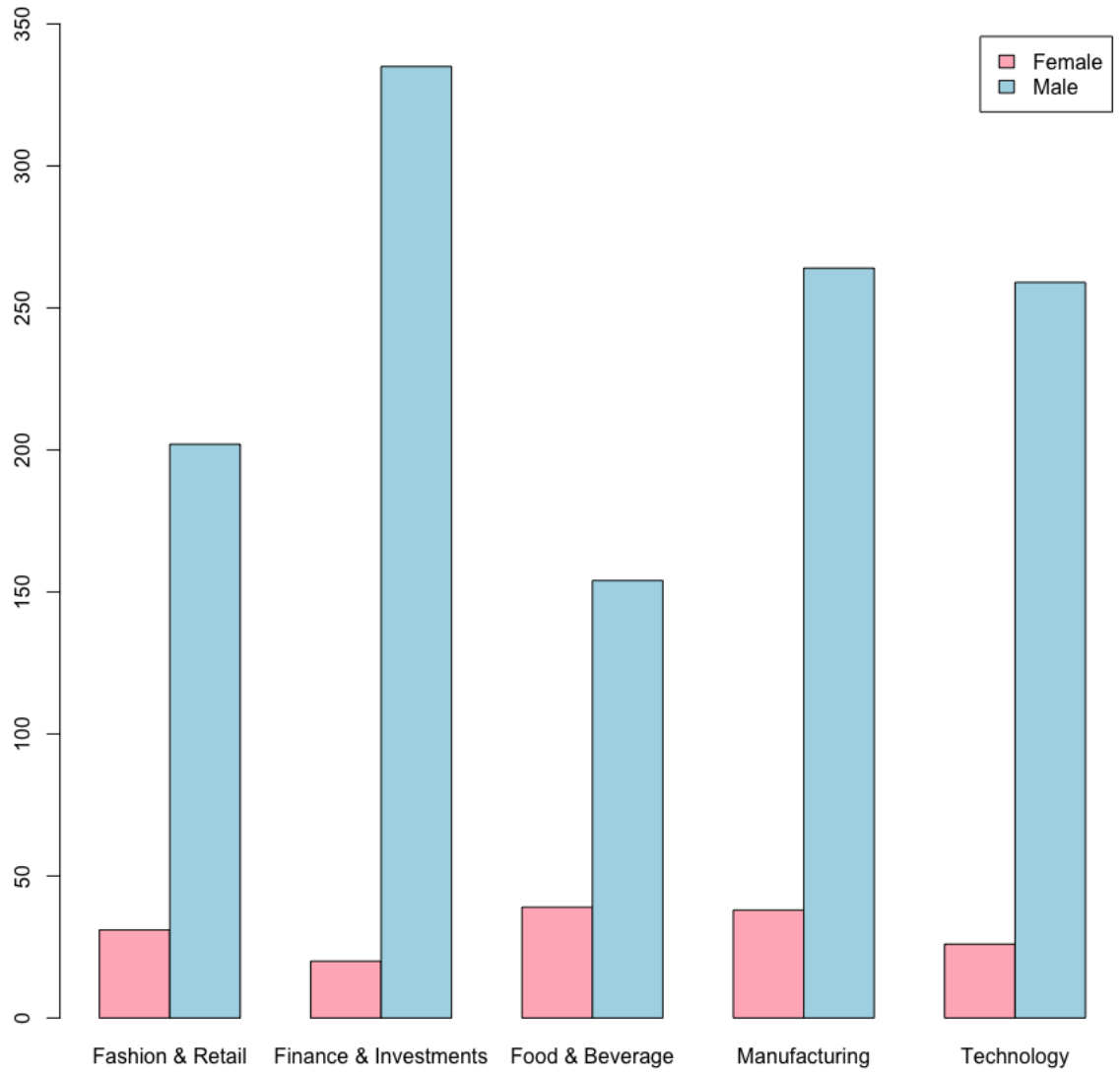
```
#c)
top_categories <-sort(table(forbes$category), decreasing = TRUE)[1:5]
# Subset of the dataset for the top 5 categories
subset_forbes <- forbes[forbes$category %in% names(top_categories), ]
top_five <- table(subset_forbes$category,subset_forbes$gender)
bar_names <- rownames(top_five)
par(mar=c(3,3,2,0))
barplot(t(top_five),beside = TRUE,col = c("lightpink","lightblue"),names.arg = bar_names,ylim =
c(0,350),legend.text = c("Female","Male"))
```

Console section:c

```
> top_categories <-sort(table(forbes$category), decreasing = TRUE)[1:5]
> # Subset of the dataset for the top 5 categories
> subset_forbes <- forbes[forbes$category %in% names(top_categories), ]
> top_five <- table(subset_forbes$category,subset_forbes$gender)
```

```
> bar_names <- rownames(top_five)
> par(mar=c(3,3,2,0))
>
> barplot(t(top_five), beside = TRUE,col = c("lightpink","lightblue"),names.arg = bar_names,ylim
= c(0,350),legend.text = c("Female","Male"))
```

Plot:c



Section:D

d) following are inferences can be drawn from above plots

1.Threre are around 88% of male and around 12% of female among the billionaire datasets

2. Most billionaires are from United State followed by China.

3. most of the billionaires are from finance & Investments categories followed by Manufacturing.
4. Highest number of billionaires are from Finance and investments
5. highest numbers of male billionaires are from Finance and investments and Highest number of female billionaires are from Food and Beverage categories.

****

Part 2

Code section: a

```
us_quarters <- read.csv("https://people.bu.edu/kalathur/datasets/us_quarters.csv")
attach(us_quarters)
#a)
highest_denvermint_state <- subset(us_quarters,DenverMint==max(DenverMint))
highest_phyllymint_state <-  subset(us_quarters,PhillyMint==max(PhillyMint))
lowest_denvermint_state <- subset(us_quarters,DenverMint==min(DenverMint))
lowest_phyllymint_state <- subset(us_quarters,PhillyMint==min(PhillyMint))
paste("The highest number of quaters produced for DenverMint is by
",highest_denvermint_state$State,"State which is",
    highest_denvermint_state$DenverMint)
paste("The highest number of quaters produced for PhyllyMint is by
",highest_phyllymint_state$State,"State which is",
    highest_phyllymint_state$PhillyMint)
paste("The lowest number of quaters produced by DenverMint is by
",lowest_denvermint_state$State,"State which is",
   lowest_denvermint_state$DenverMint)

paste("The lowest number of quaters produced for PhyllyMint is by
",lowest_phyllymint_state$State,"State which is",
    lowest_phyllymint_state$PhillyMint)
```

Console section :a

```
> us_quarters <- read.csv("https://people.bu.edu/kalathur/datasets/us_quarters.csv")
> attach(us_quarters)
> #a)
> highest_denvermint_state <- subset(us_quarters,DenverMint==max(DenverMint))
> highest_phyllymint_state <-  subset(us_quarters,PhillyMint==max(PhillyMint))
> lowest_denvermint_state <- subset(us_quarters,DenverMint==min(DenverMint))
> lowest_phyllymint_state <- subset(us_quarters,PhillyMint==min(PhillyMint))
> paste("The highest number of quaters produced for DenverMint is by
",highest_denvermint_state$State,"State which is",
+      highest_denvermint_state$DenverMint)
```

```
[1] "The highest number of quaters produced for DenverMint is by  Connecticut State which is
657880"
> paste("The highest number of quaters produced for PhyllyMint is by
",highest_phyllymint_state$State,"State which is",
+      highest_phyllymint_state$PhillyMint)
[1] "The highest number of quaters produced for PhyllyMint is by  Virginia State which is
943000"
> paste("The lowest number of quaters produced by DenverMint is by
",lowest_denvermint_state$State,"State which is",
+     lowest_denvermint_state$DenverMint)
[1] "The lowest number of quaters produced by DenverMint is by  Oklahoma State which is
194600"
```

```
> paste("The lowest number of quaters produced for PhyllyMint is by
",lowest_phyllymint_state$State,"State which is",
+      lowest_phyllymint_state$PhillyMint)
[1] "The lowest number of quaters produced for PhyllyMint is by  Iowa State which is 213800"
```

Code section: b

```
data_matrix_quaters <-rbind(DenverMint,PhillyMint)
data_matrix_quaters
state_names <-State
bar_colors <- c("blue", "grey")
bar_legend <- c("Denvermint","Phillymint")
options(scipen = 5)
par(mar=c(8,5,3,0))
barplot(data_matrix_quaters,beside = TRUE, col = bar_colors,legend.text = bar_legend,
      ylim = c(0,1000000), names.arg = state_names,las = 2)
```

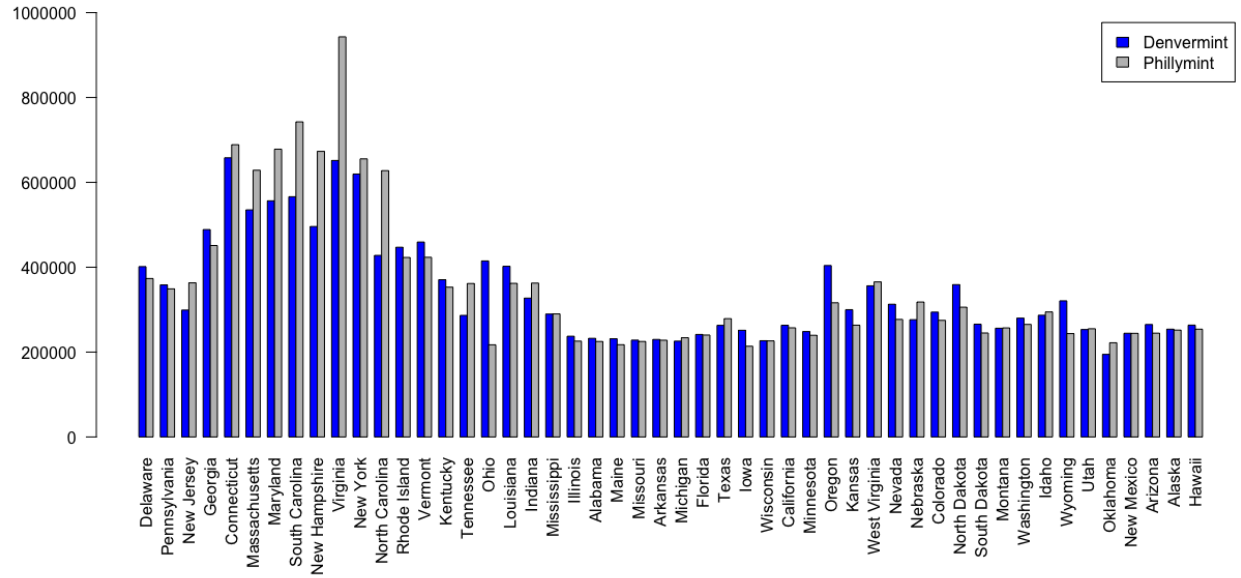
Console section: b

```
> data_matrix_quaters <-rbind(DenverMint,PhillyMint)
> data_matrix_quaters
            [,1]   [,2]   [,3]   [,4]   [,5]   [,6]   [,7]   [,8]   [,9]  [,10]  [,11]  [,12]  [,13]  [,14]  [,15]  [,16]
[,17]  [,18]  [,19]  [,20]
DenverMint 401424 358332 299028 488744 657880 535184 556532 566208 495976 651616
619640 427876 447100 459404 370564 286468 414832 402204 327200 289600
PhillyMint 373400 349000 363200 451188 688744 628600 678200 742576 673040 943000
655400 627600 423000 423400 353000 361600 217200 362000 362600 290000
            [,21]  [,22]  [,23]  [,24]  [,25]  [,26]  [,27]  [,28]  [,29]  [,30]  [,31]  [,32]  [,33]  [,34]  [,35]
[,36]  [,37]  [,38]  [,39]  [,40]
DenverMint 237400 232400 231400 228200 229800 225800 241600 263000 251400 226800
263200 248400 404000 300000 356200 312800 276400 294200 359000 265800
```

PhillyMint 225800 225000 217400 225000 228000 233800 240200 278800 213800 226400
257200 239600 316200 263400 365400 277000 318000 274800 305800 245000
[,41] [,42] [,43] [,44] [,45] [,46] [,47] [,48] [,49] [,50]
DenverMint 256240 280000 286800 320800 253200 194600 244400 265000 254000 263600
PhillyMint 257000 265200 294600 243600 255000 222000 244200 244600 251800 254000

```
> state_names <-State
> bar_colors <- c("blue", "grey")
> bar_legend <- c("Denvermint","Phillymint")
> options(scipen = 5)
> par(mar=c(8,5,3,0))
> barplot(data_matrix_quaters,beside = TRUE, col = bar_colors,legend.text = bar_legend,
+         ylim = c(0,1000000), names.arg = state_names,las = 2)
```

Plot :a



From above chart,
1. The PhillyMint produces high number of Quarters in Virginia state
2. The DenverMint produces higher number of Quarters in Connecticut State

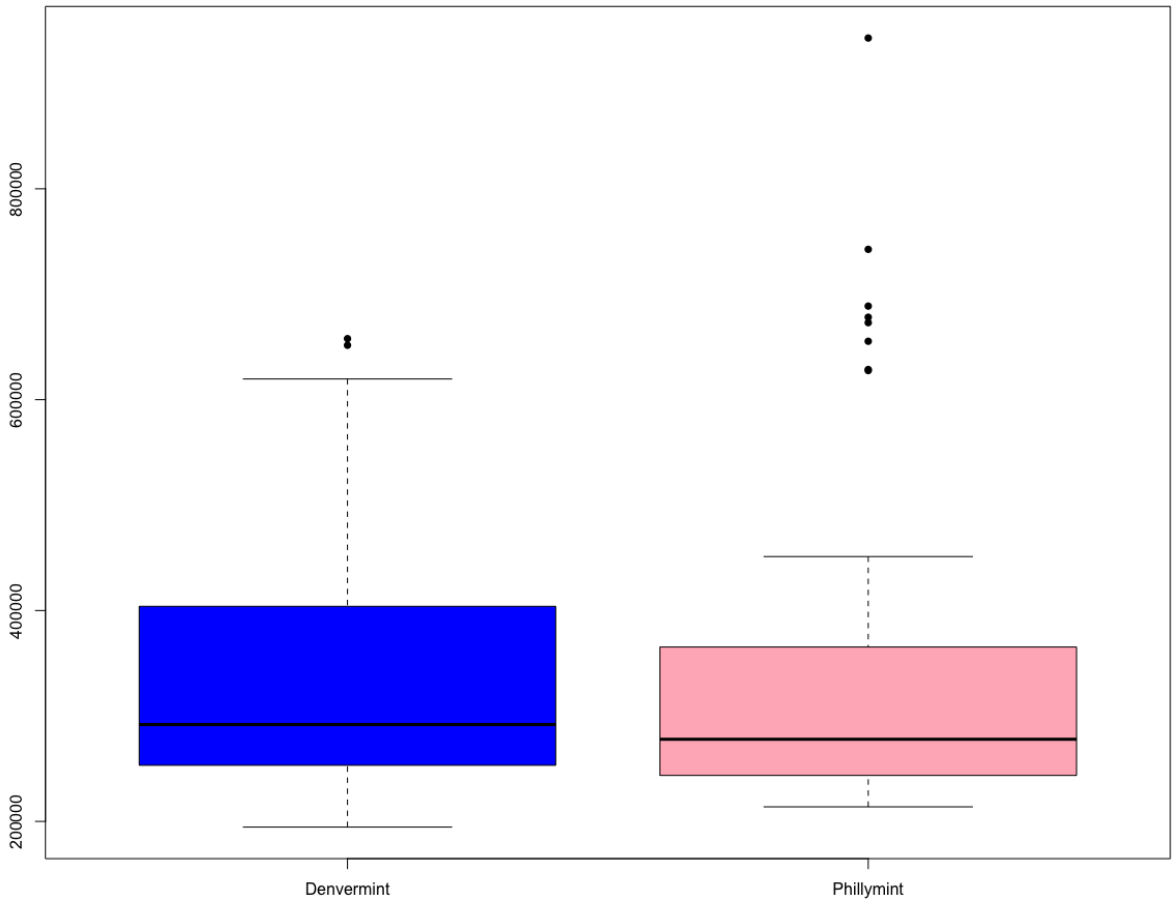
---

Code part:c

```
boxplot(DenverMint,PhillyMint,col = c("blue","lightpink"),pch=16,names =
c("Denvermint","Phillymint"))
```

Console part: c

boxplot(DenverMint,PhillyMint,col = c("blue","lightpink"),pch=16,names = c("Denvermint","Phillymint"))
Plot : c



DenverMint:
1 There are two outliers at the upper end of the data
2 The upper whisker is longer than the lower whisker, suggesting that there is greater variability or spread in the upper part of the data distribution.
Phillymint:
1 There are 8 outliers at the upper end of the data.
#2 lower whisker is short which means there is less variability/spread in data in the lower part of the data.

Code part :d
#d
For DenverMint
#finding five number in Denvermint column

```
fivnum_denv <- fivenum(DenverMint)
#finding outliers towards upper end
denv_out_high <- fivnum_denv[4]+1.5*(fivnum_denv[4]-fivnum_denv[2])
denver_outlier_high <- subset(us_quarters,DenverMint > denv_out_high)
denver_outlier_high$State
#finding outliers towars lower end
denv_out_low <- fivnum_denv[2]-1.5*(fivnum_denv[4]-fivnum_denv[2])
denver_outlier_low <- subset(us_quarters,DenverMint < denv_out_low)
denver_outlier_low
```

so, there is no outliers in lower ends

For Phillymint

```
fivnum_philly <- fivenum(PhillyMint)
#finding outliers towards upper end
philly_out <- fivnum_philly[4]+1.5* (fivnum_philly[4]-fivnum_philly[2])
philly_outlier <- subset(us_quarters,PhillyMint>philly_out)
#outlier states are
philly_outlier$State

#finding outliers towards lower end.
philly_out_low <- fivnum_philly[2]-1.5*(fivnum_philly[4]-fivnum_philly[2])
philly_outlier_low <- subset(us_quarters,PhillyMint< philly_out_low)
philly_outlier_low
```

so, there is no outliers in lower ends

Console section :d

```
#For DenverMint
> #finding five number in Denvermint column
> fivnum_denv <- fivenum(DenverMint)
> #finding outliers towards upper end
> denv_out_high <- fivnum_denv[4]+1.5*(fivnum_denv[4]-fivnum_denv[2])
> denver_outlier_high <- subset(us_quarters,DenverMint > denv_out_high)
> denver_outlier_high$State
[1] "Connecticut" "Virginia"
> #finding outliers towars lower end
> denv_out_low <- fivnum_denv[2]-1.5*(fivnum_denv[4]-fivnum_denv[2])
> denver_outlier_low <- subset(us_quarters,DenverMint < denv_out_low)
> denver_outlier_low
[1] State      DenverMint PhillyMint
<0 rows> (or 0-length row.names)
> #so there is no outliers in lower ends data
>
```

```
>
> #for Phillymint
> fivnum_philly <- fivenum(PhillyMint)
> #finding outliers towards upper end
> philly_out <- fivnum_philly[4]+1.5* (fivnum_philly[4]-fivnum_philly[2])
> philly_outlier <- subset(us_quarters,PhillyMint>philly_out)
> #outlier states are
> philly_outlier$State
[1] "Connecticut"    "Massachusetts"  "Maryland"       "South Carolina" "New Hampshire"
"Virginia"       "New York"       "North Carolina"
>
> #finding outliers towards lower end.
> philly_out_low <- fivnum_philly[2]-1.5*(fivnum_philly[4]-fivnum_philly[2])
> philly_outlier_low <- subset(us_quarters,PhillyMint< philly_out_low)
> philly_outlier_low
[1] State      DenverMint PhillyMint
<0 rows> (or 0-length row.names)
> #so there is no outliers in lower ends
```

****

Part 3

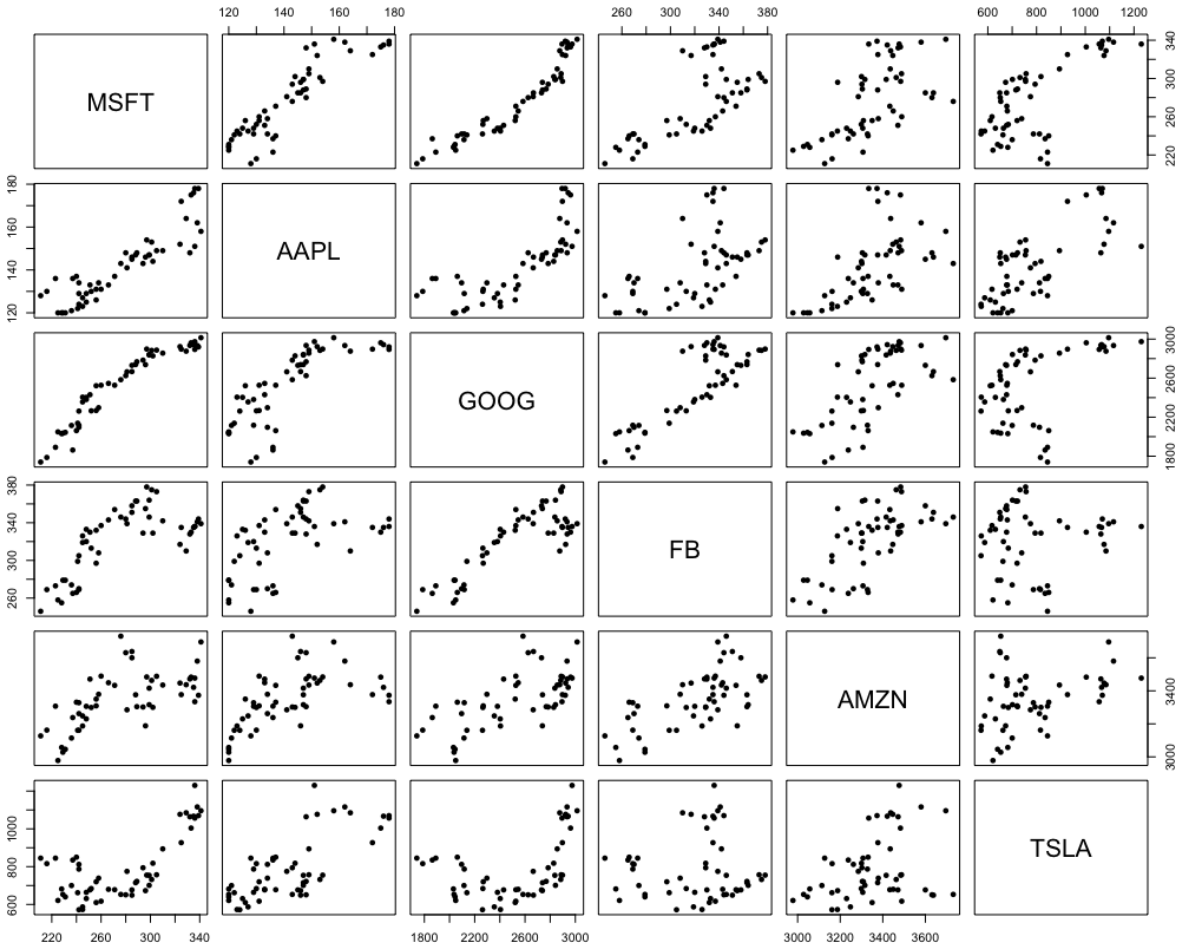
Code section :a

```
stocks <- read.csv("https://people.bu.edu/kalathur/datasets/stocks.csv")
#a)
#removing date column from data set
stocks <- stocks[,colnames(stocks)!="Date"]
# drawing pair plot between different pairs among six stocks.
pairs(stocks,pch=16)
```

Console Section :a

```
> stocks <- read.csv("https://people.bu.edu/kalathur/datasets/stocks.csv")
> #a)
> #removing date column from data set
> stocks <- stocks[,colnames(stocks)!="Date"]
> # drawing pair plot between different pairs among six stocks.
> pairs(stocks,pch=16)
```

Plot :a



Code section :b

```
#b)
#Correlation matrix among the six stocks in the data set
round(cor(stocks),digits = 2)
```

Console section: b

```
> #b)
> #Correlation matrix among the six stocks in the data set
> round(cor(stocks),digits = 2)
     MSFT AAPL GOOG   FB AMZN TSLA
MSFT 1.00 0.90 0.95 0.68 0.64 0.71
AAPL 0.90 1.00 0.79 0.54 0.59 0.73
GOOG 0.95 0.79 1.00 0.85 0.67 0.47
FB   0.68 0.54 0.85 1.00 0.66 0.05
AMZN 0.64 0.59 0.67 0.66 1.00 0.34
TSLA 0.71 0.73 0.47 0.05 0.34 1.00
```

#c)

1. Google and Microsoft stocks has the strongest positive correlations (0.95)
2.Tesla and Facebook has weakest positive correlations (0.05)
3 there is no negative correlation among all six stocks which means there is no such stock which increases its value while other decrease.
4 There is also strongest relationships between Microsoft and apple (0.90) which means increase or decrease in value of Microsoft stock also increase or decreases value of apple stock.(90% of time)

Code section : d

```
cm <- round(cor(stocks),digits = 2)
#names of stocks
stock_names <- rownames(cm)

for (i in seq(1, ncol(cm))) { #looping through each row of correlation matrix
  pick_row <- cm[i,] # in every loop, it picks one row
  #on each row it sorts the values, remove the first index value which is not important and then finds top 3 values
  top3_stocks <- sort (pick_row,decreasing = TRUE)[-1][1:3]
  top3_stocks_names <- names(top3_stocks) #names for top 3 stocks in each row
  cat("Top 3 for Stock",stock_names[i],"\n",top3_stocks_names,"\n",top3_stocks,"\n","\n")

}
```

Console section :d

```
> cm <- round(cor(stocks),digits = 2)
> #names of stocks
> stock_names <- rownames(cm)

> for (i in seq(1,ncol(cm))) { #looping through each row of correlation matrix
+   pick_row <- cm[i,] # in every loop, it pick one row
+   #on each row it sorts the values, remove the first index value which is not important  and then finds top 3 values
+   top3_stocks <- sort(pick_row,decreasing = TRUE)[-1][1:3]
+   top3_stocks_names <- names(top3_stocks) #names for top 3 stocks in each row
+   cat("Top 3 for Stock",stock_names[i],"\n",top3_stocks_names,"\n",top3_stocks,"\n","\n")
+
+ }
Top 3 for Stock MSFT
 GOOG AAPL TSLA
 0.95 0.9 0.71
```

Top 3 for Stock AAPL
 MSFT GOOG TSLA
 0.9 0.79 0.73

Top 3 for Stock GOOG
 MSFT FB AAPL
 0.95 0.85 0.79

Top 3 for Stock FB
 GOOG MSFT AMZN
 0.85 0.68 0.66

Top 3 for Stock AMZN
 GOOG FB MSFT
 0.67 0.66 0.64

Top 3 for Stock TSLA
 AAPL MSFT GOOG
 0.73 0.71 0.47

****

Part 4

Code Section :a

```
#a)
hist_scores <- hist(Score,col = "lightblue")
breaks_score <- hist_scores$breaks
l <- length(breaks_score)
count <- hist_scores$counts
i <- 1
while (i<l) {
  start_val <- breaks_score[i] #starting value in each interval
  end_val <- breaks_score[i+1] #ending value in  each interval
  interval_count <- count[i] #counts in each interval
  cat(interval_count,"students in range (",start_val,",",end_val,"]","\n")
  i <- i+1
}
```

Console section :b

```
#a)
> hist_scores <- hist(Score,col = "lightblue")
```

```
> breaks_score <- hist_scores$breaks
> l <- length(breaks_score)
> count <- hist_scores$counts
> i <- 1
> while (i<l) {
+   start_val <- breaks_score[i] #starting value in each interval
+   end_val <- breaks_score[i+1] #ending value in  each interval
+   interval_count <- count[i] #counts in each interval
+   cat(interval_count,"students in range (",start_val,",",end_val,"]","\n")
+   i <- i+1
+ }
3 students in range ( 35 , 40 ]
4 students in range ( 40 , 45 ]
10 students in range ( 45 , 50 ]
13 students in range ( 50 , 55 ]
17 students in range ( 55 , 60 ]
27 students in range ( 60 , 65 ]
13 students in range ( 65 , 70 ]
8 students in range ( 70 , 75 ]
3 students in range ( 75 , 80 ]
2 students in range ( 80 , 85 ]
```

Plot :a

Code section :a

```
#b)
#costomizing the above scores
hist_scores2 <- hist(Score,col = "lightpink",breaks = seq(30,90,length.out = 4))
len_breaks <- length(hist_scores2$breaks)
count_interval <- hist_scores2$counts
letter_grade <-LETTERS[(len_breaks-1):1]#intervals is one less than number of breaks
letter_grade


j <- 1
while (j<len_breaks) {
  start_score_interval <- hist_scores2$breaks[j] #starting value in each interval
  end_score_interval<- hist_scores2$breaks[j+1] #ending value in  each interval
  count_in_interval <- count_interval[j] #counts in each interval
  cat(count_in_interval,"students in",letter_grade[j],"grade range (",
      start_score_interval,",",end_score_interval,"]","\n")
  j <- j+1

}
```

Console section :b

```
> #b)
> #costomizing the above scores
> hist_scores2 <- hist(Score,col = "lightpink",breaks = seq(30,90,length.out = 4))
> len_breaks <- length(hist_scores2$breaks)
> count_interval <- hist_scores2$counts
> letter_grade <-LETTERS[(len_breaks-1):1]#intervals is one less than number of breaks
> letter_grade
[1] "C" "B" "A"
>
>
> j <- 1
> while (j<len_breaks) {
+   start_score_interval <- hist_scores2$breaks[j] #starting value in each interval
+   end_score_interval<- hist_scores2$breaks[j+1] #ending value in  each interval
+   count_in_interval <- count_interval[j] #counts in each interval
+   cat(count_in_interval,"students in",letter_grade[j],"grade range (",
+       start_score_interval,",",end_score_interval,"]","\n")
+   j <- j+1
+
+ }
17 students in C grade range ( 30 , 50 ]
70 students in B grade range ( 50 , 70 ]
```

13 students in A grade range (70 , 90]

Plot section:b

The End!

****