ASSIGNMENT 4

CIS 602-02

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30 November 2016

Q1.

```
hdd <- read.csv("hd.csv", header = TRUE)
```

```
summary(hdd)
```

```
##         Qname          Q1              Q2              Q3       
##  Abdelhamid: 1   Min.   :22.00   Min.   : 5.00   Min.   :0.000  
##  Alex      : 1   1st Qu.:24.50   1st Qu.: 8.00   1st Qu.:1.000  
##  Ayat      : 1   Median :26.00   Median : 9.00   Median :1.000  
##  Bobby     : 1   Mean   :28.65   Mean   :10.54   Mean   :1.587  
##  Chris     : 1   3rd Qu.:29.00   3rd Qu.:11.00   3rd Qu.:2.000  
##  David     : 1   Max.   :58.00   Max.   :41.00   Max.   :7.000  
##  (Other)   :17                                                  
##        Q4               Q5              Q6               Q7       
##  Min.   : 150.0   Min.   :   0   Min.   :  1.00   Min.   :10.00  
##  1st Qu.: 410.5   1st Qu.: 115   1st Qu.: 50.00   1st Qu.:40.00  
##  Median :2694.0   Median : 230   Median : 70.00   Median :50.00  
##  Mean   :3963.3   Mean   :1147   Mean   : 60.52   Mean   :55.04  
##  3rd Qu.:7050.0   3rd Qu.:2300   3rd Qu.: 80.00   3rd Qu.:77.50  
##  Max.   :9304.0   Max.   :2400   Max.   :100.00   Max.   :92.00  
##                                                                  
##        Q8               Q9              Q10               Q11        
##  Min.   :  1.00   Min.   :  1.0   Min.   :  10.0   Min.   :  0.00  
##  1st Qu.: 55.00   1st Qu.: 22.5   1st Qu.:  90.0   1st Qu.: 16.50  
##  Median : 72.00   Median : 40.0   Median : 300.0   Median : 30.00  
##  Mean   : 63.35   Mean   : 48.0   Mean   : 554.3   Mean   : 51.74  
##  3rd Qu.: 85.00   3rd Qu.: 71.5   3rd Qu.: 525.0   3rd Qu.: 85.00  
##  Max.   :100.00   Max.   :100.0   Max.   :3650.0   Max.   :213.00  
##                                                                     
##       Q12               Q13               Q14             Q15        
##  Min.   :  20.0   Min.   :   0.0   Min.   : 0.00   Min.   : 69.00  
##  1st Qu.: 250.0   1st Qu.: 142.0   1st Qu.:41.50   1st Qu.: 80.00  
##  Median : 500.0   Median : 295.0   Median :60.00   Median : 90.00  
##  Mean   : 931.9   Mean   : 344.9   Mean   :55.39   Mean   : 89.22  
##  3rd Qu.:1173.0   3rd Qu.: 468.0   3rd Qu.:76.50   3rd Qu.:100.00  
##  Max.   :3000.0   Max.   :1150.0   Max.   :99.00   Max.   :100.00  
## 
```

```
##       Q16              Q17              Q18             Q19       
##  Min.   : 50.00   Min.   : 1.000   Min.   : 2.00   Min.   : 2.000  
##  1st Qu.: 64.50   1st Qu.: 3.500   1st Qu.: 9.00   1st Qu.: 3.000  
##  Median : 83.00   Median : 5.000   Median :16.00   Median : 5.000  
##  Mean   : 80.48   Mean   : 6.478   Mean   :16.52   Mean   : 6.913  
##  3rd Qu.:100.00   3rd Qu.:10.000   3rd Qu.:21.00   3rd Qu.: 9.000  
##  Max.   :100.00   Max.   :15.000   Max.   :49.00   Max.   :22.000  
##                                                                    
##       Q20             Q21              Q22              Q23        
##  Min.   :32.00   Min.   :  1.00   Min.   : 0.000   Min.   :  0.00  
##  1st Qu.:69.00   1st Qu.: 30.00   1st Qu.: 1.000   1st Qu.:  0.00  
##  Median :72.00   Median : 71.00   Median : 3.500   Median :  2.00  
##  Mean   :70.83   Mean   : 58.87   Mean   : 5.748   Mean   : 27.39  
##  3rd Qu.:75.50   3rd Qu.: 80.00   3rd Qu.: 9.000   3rd Qu.: 10.50  
##  Max.   :89.00   Max.   :100.00   Max.   :34.000   Max.   :427.00  
##                                                                    
##       Q24               Q25              Q26              Q27        
##  Min.   :  0.000   Min.   : 2.00   Min.   : 0.000   Min.   :     0  
##  1st Qu.:  1.000   1st Qu.:10.00   1st Qu.: 2.000   1st Qu.: 10052  
##  Median :  3.000   Median :14.00   Median : 3.000   Median : 45000  
##  Mean   :  9.739   Mean   :18.35   Mean   : 4.609   Mean   : 75014  
##  3rd Qu.:  7.500   3rd Qu.:25.00   3rd Qu.: 5.500   3rd Qu.:122356  
##  Max.   :100.000   Max.   :47.00   Max.   :20.000   Max.   :245000  
## 
```

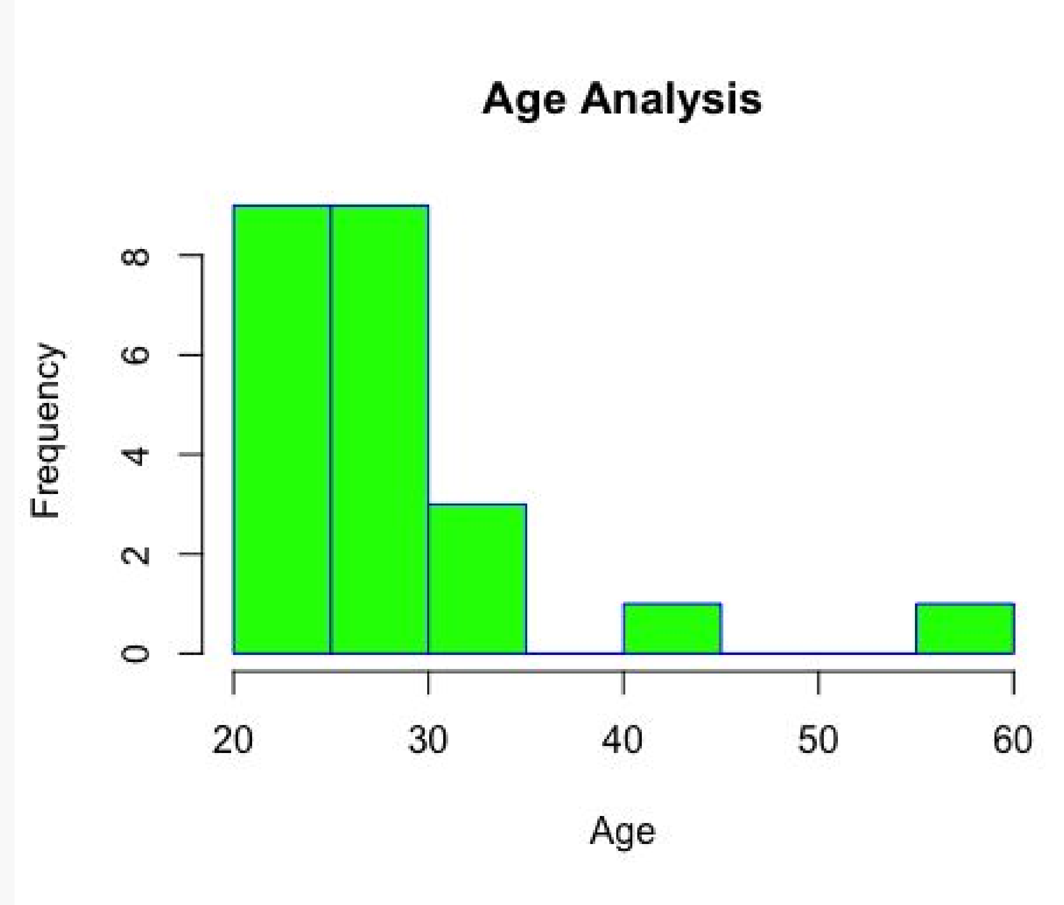
Q2

```
hist(hdd$Q1)
```

Histograms

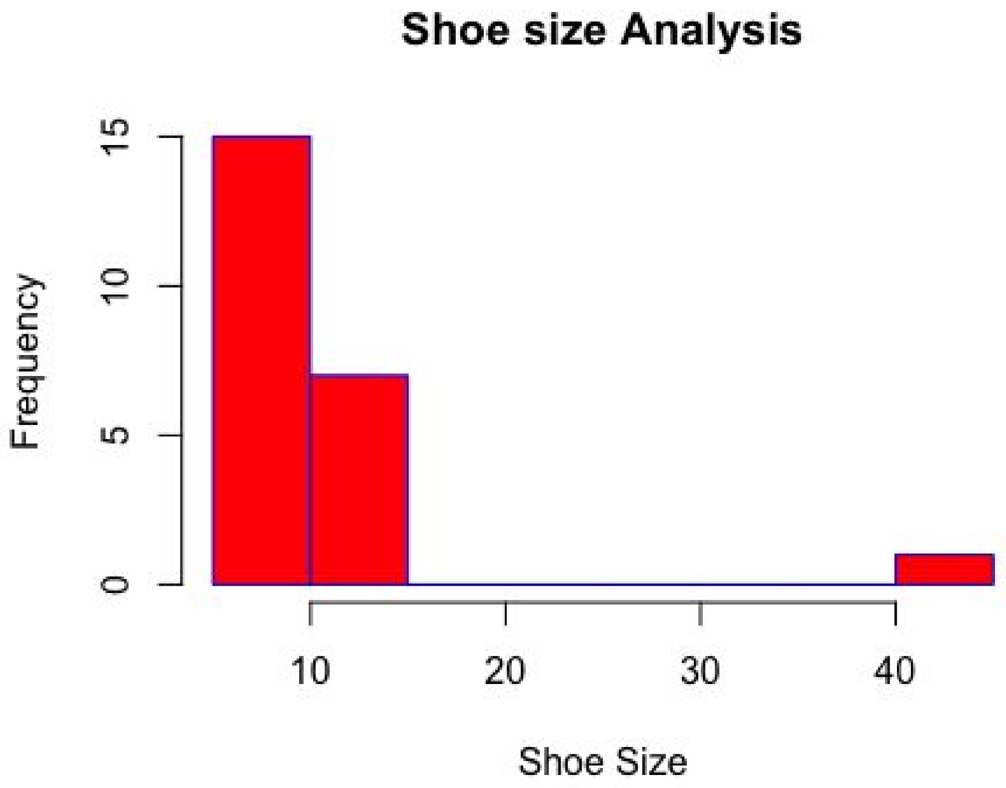
Histograms are the most commonly used graphs to show frequency distributions.

From the histograms below, it can be analysed that most number of people are in the age group 20- 30 years.



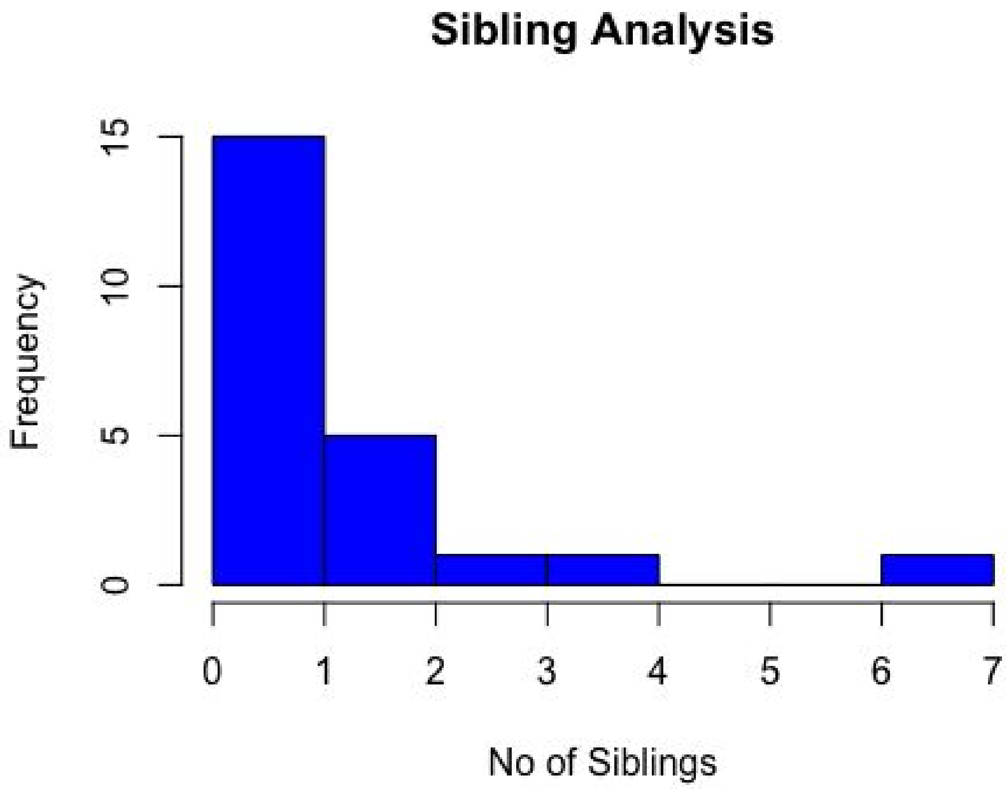
```
hist(hdd$Q2)
```

```
Here, histogram suggest most of the people in analysis are in age between 20-30.
```



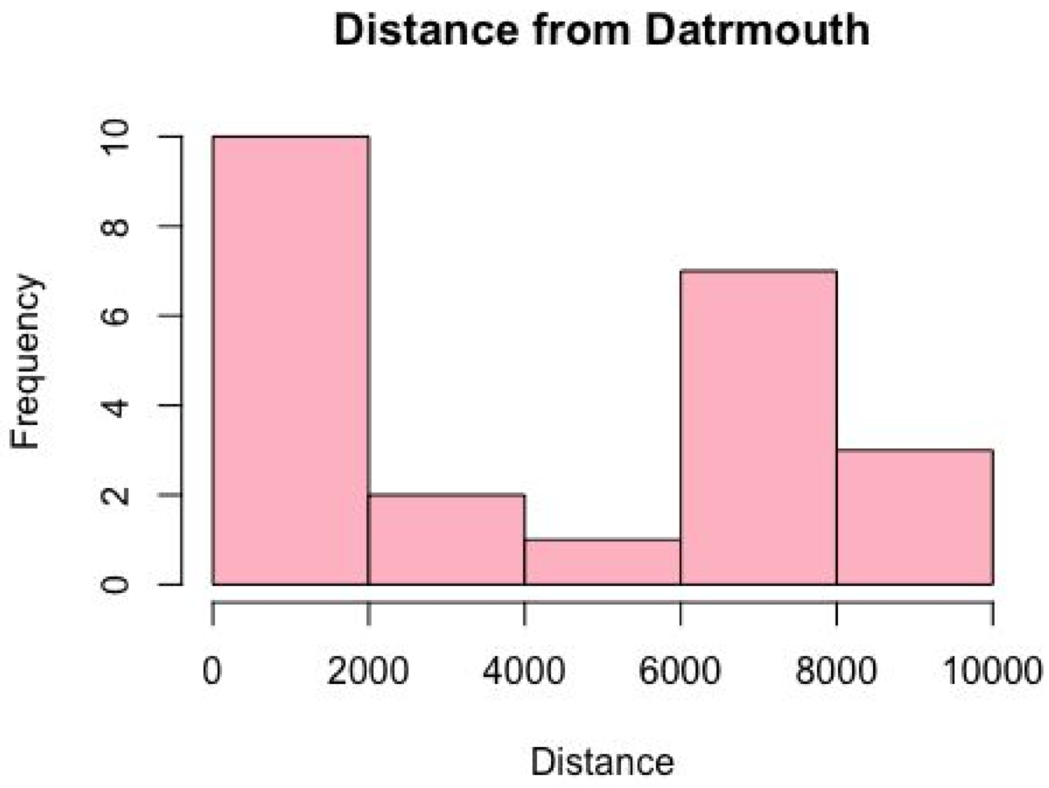
```
hist(hdd$Q3)
```

This Histogram shows that most number of people have their shoe sizes between 0- 10.



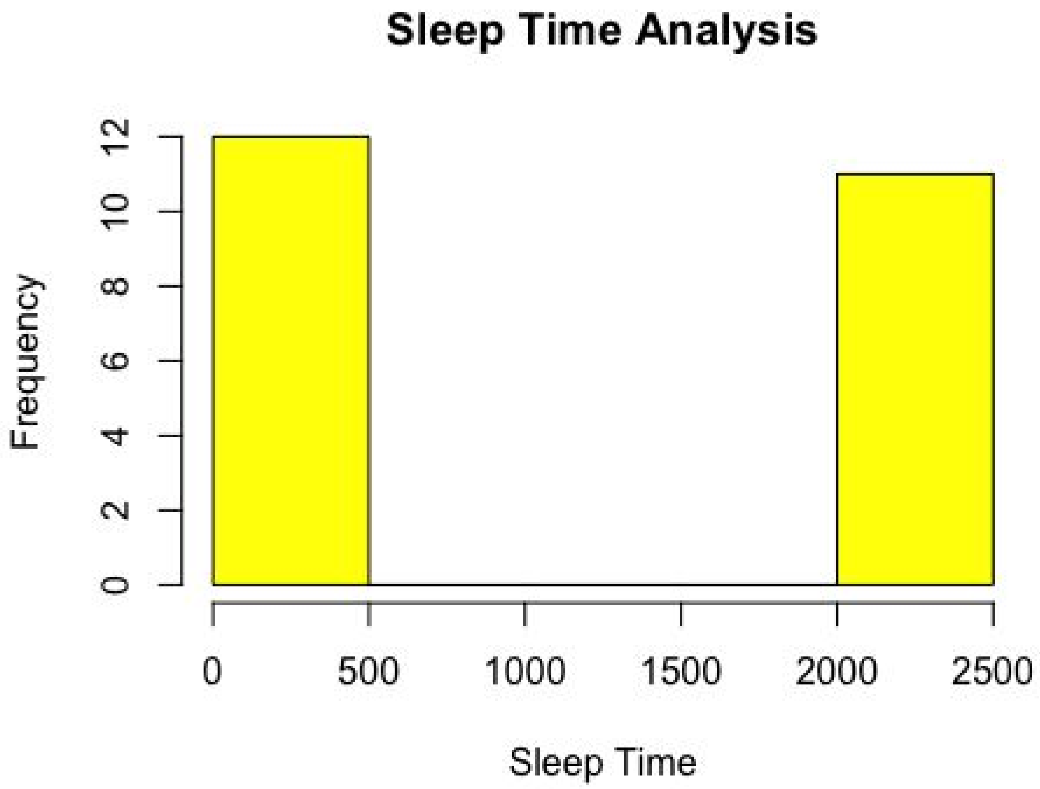
```
hist(hdd$Q4)
```

Above histogram shows that most number of people have only one sibling.



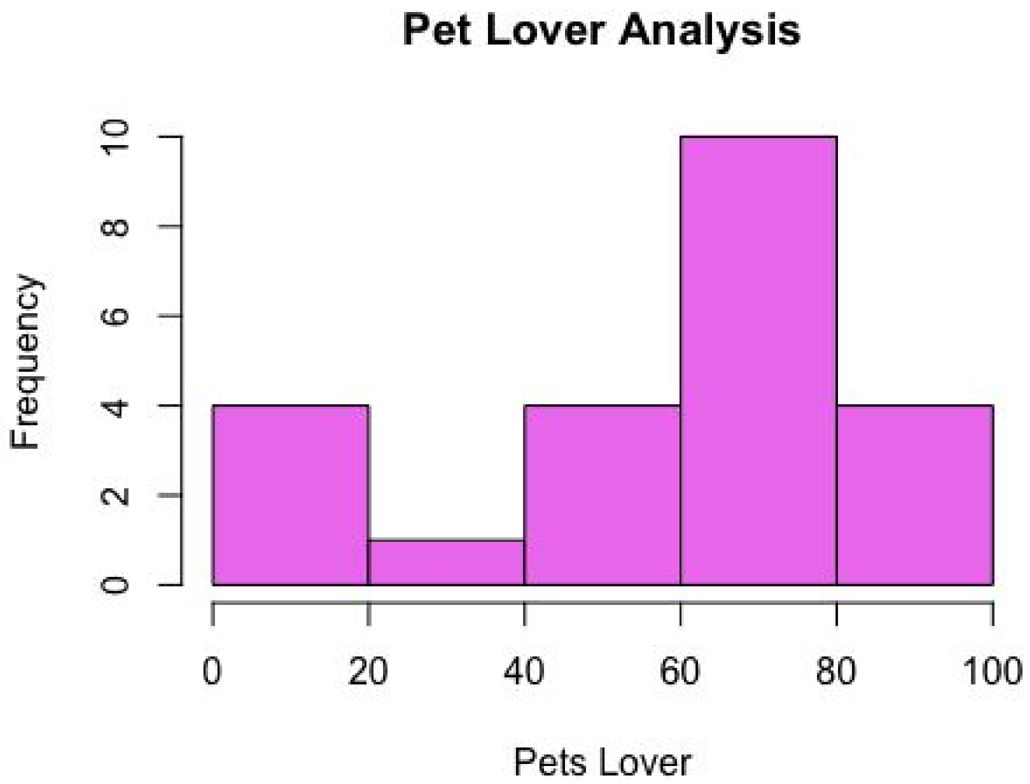
```
hist(hdd$Q5)
```

This histogram shows majority have distance greater than 5000 from their birthplace.



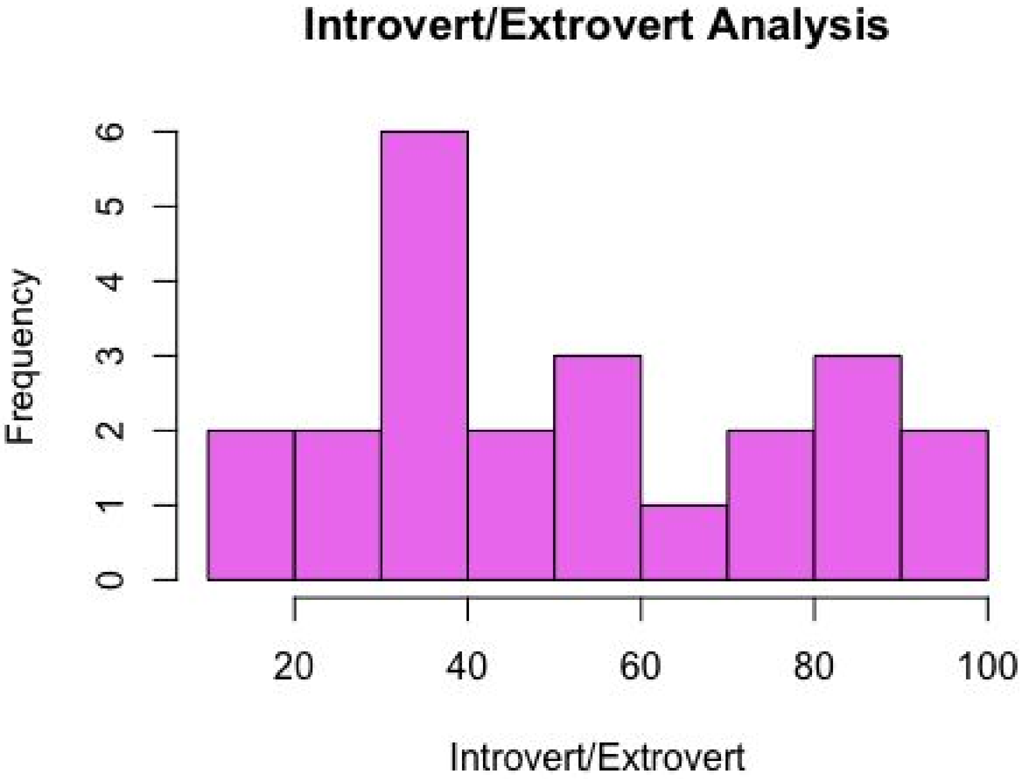
```
hist(hdd$Q6)
```

With the above histogram it can be analysed that the most people sleep between the time 12:00 am to 5:00 am and 8:00 pm to 12:00 am.



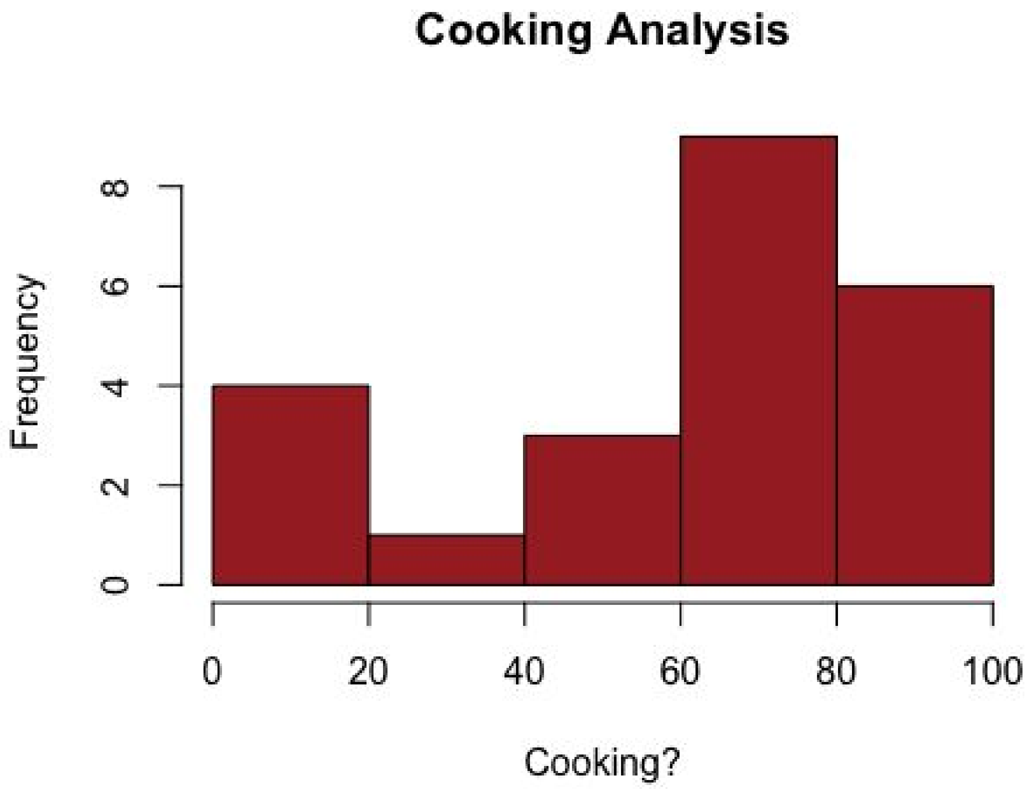
```
hist(hdd$Q7)
```

From this histogram it can be inferred that majority of the pet lovers are in the range 60 and 80



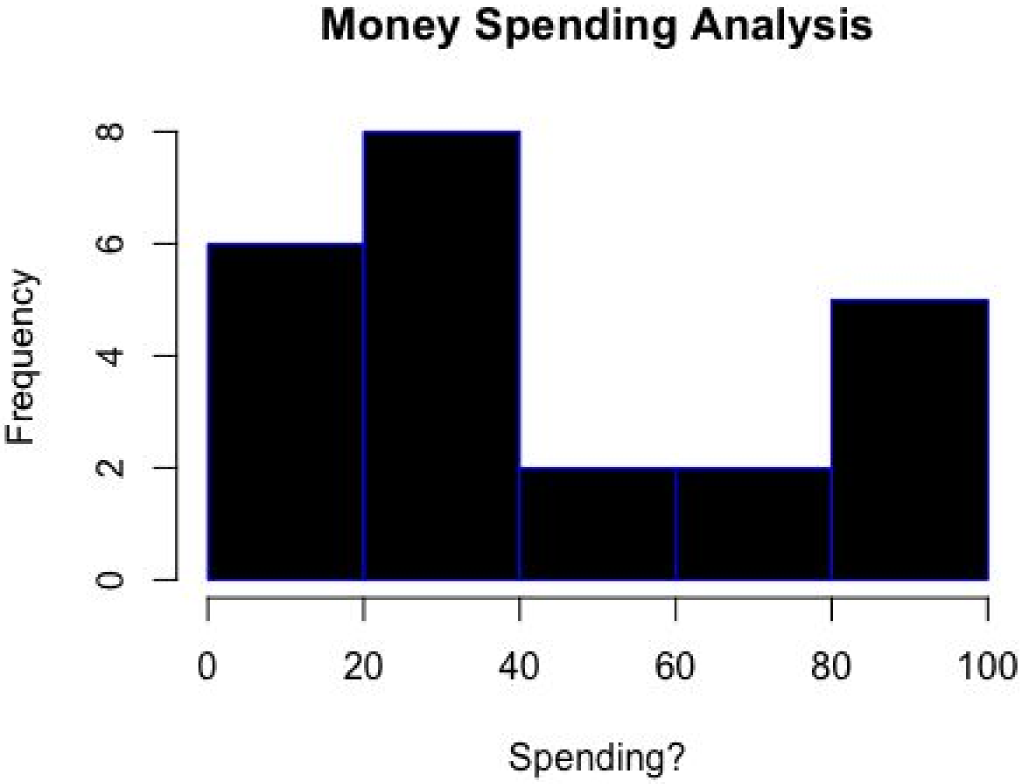
```
hist(hdd$Q8)
```

From the above histogram it can be analysed that most number of people are more introverts than extroverts. The most number of introverts are in the range 30- 40.



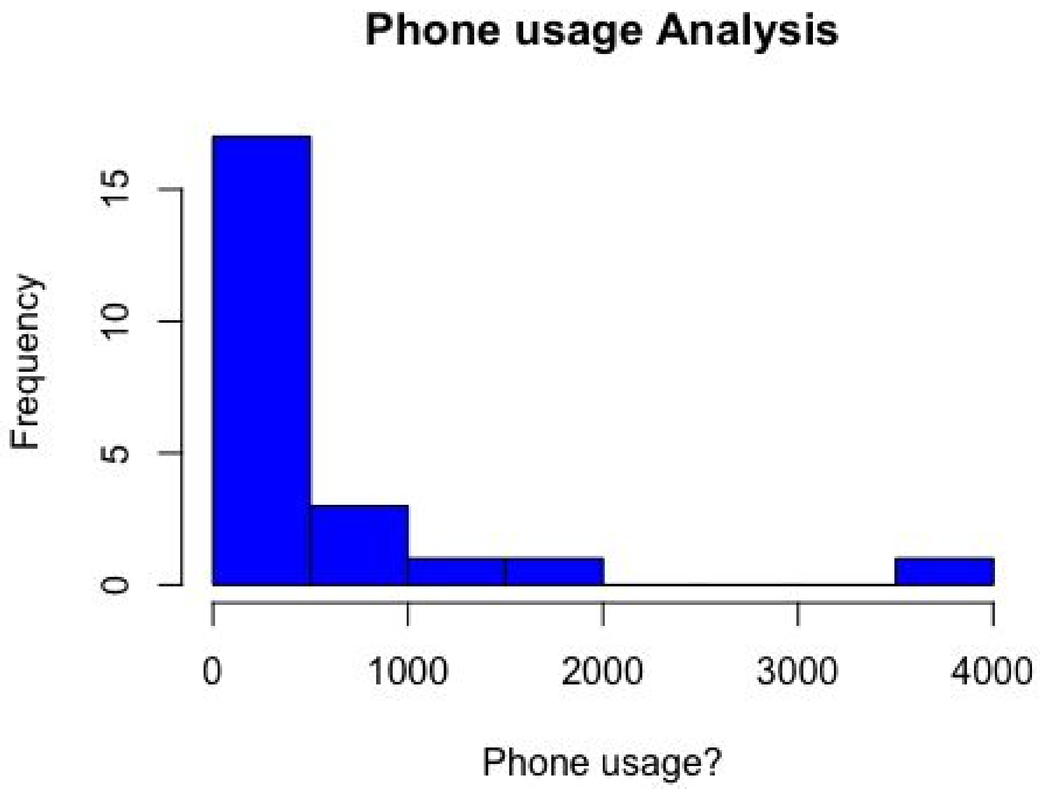
```
hist(hdd$Q9)
```

This histogram says that majority of them like to cook between 60 and 100.



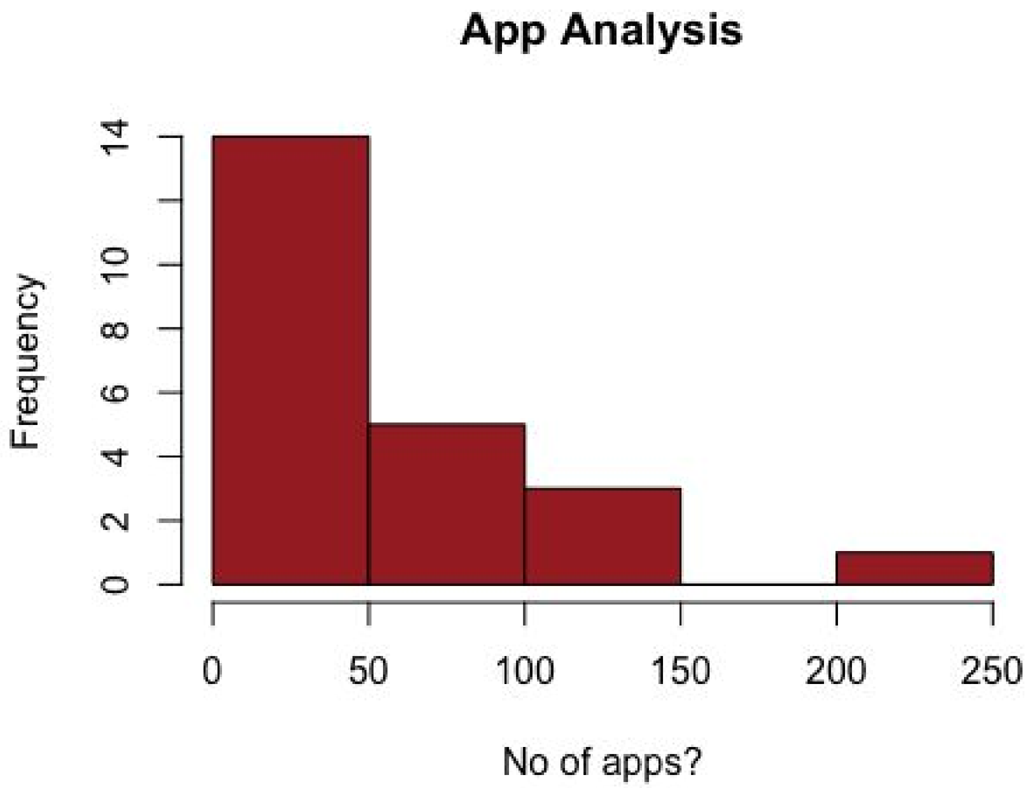
```
hist(hdd$Q10)
```

From the above histogram it can be analysed that the most number of people are money savers in the range 20-40 and 0-20, but there are also considerable amount of money spenders in the range 80-10, though it is less than jthe number of money savers.



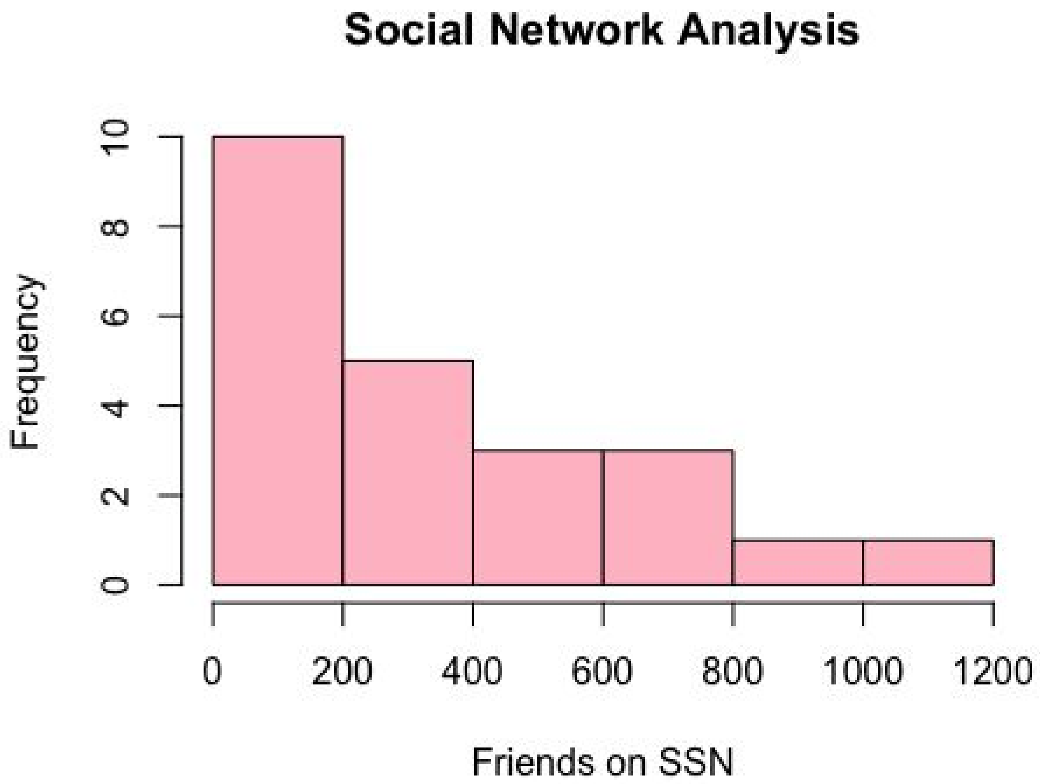
```
hist(hdd$Q11)
```

From the above histogram it can be analysed that most number of people spend 0-500 minutes talking on phone.

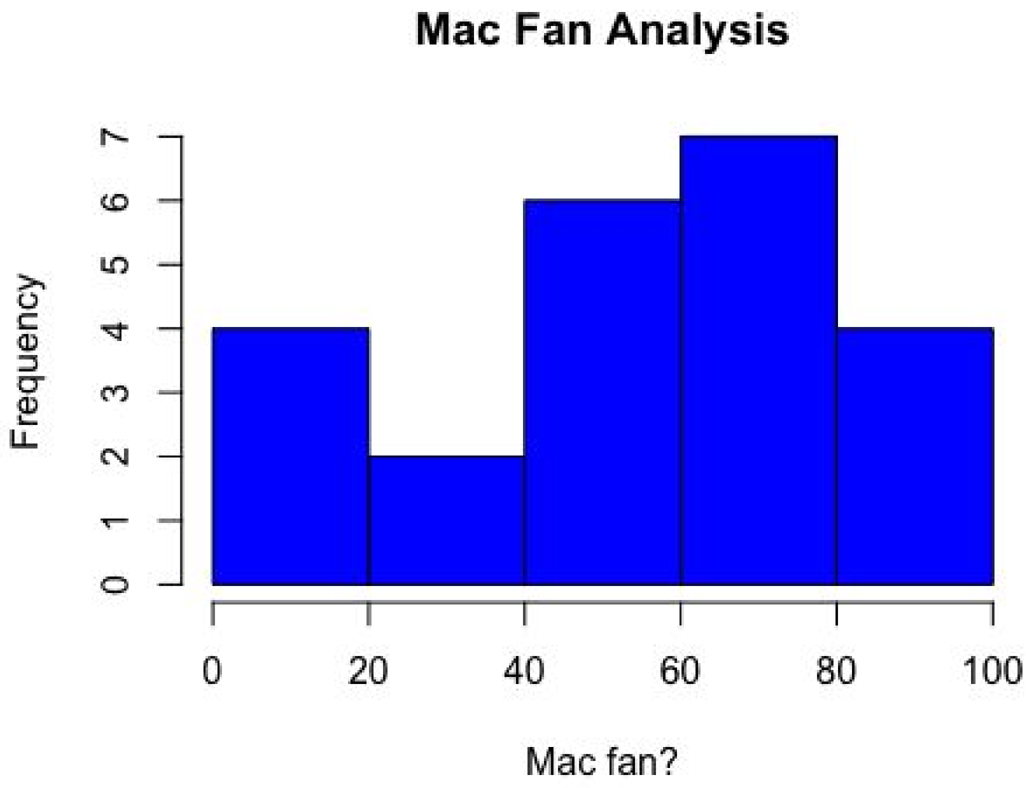


```
hist(hdd$Q13)
```

This Histogram shows that on an average there will be around 0 to 50 application installed on the phone.

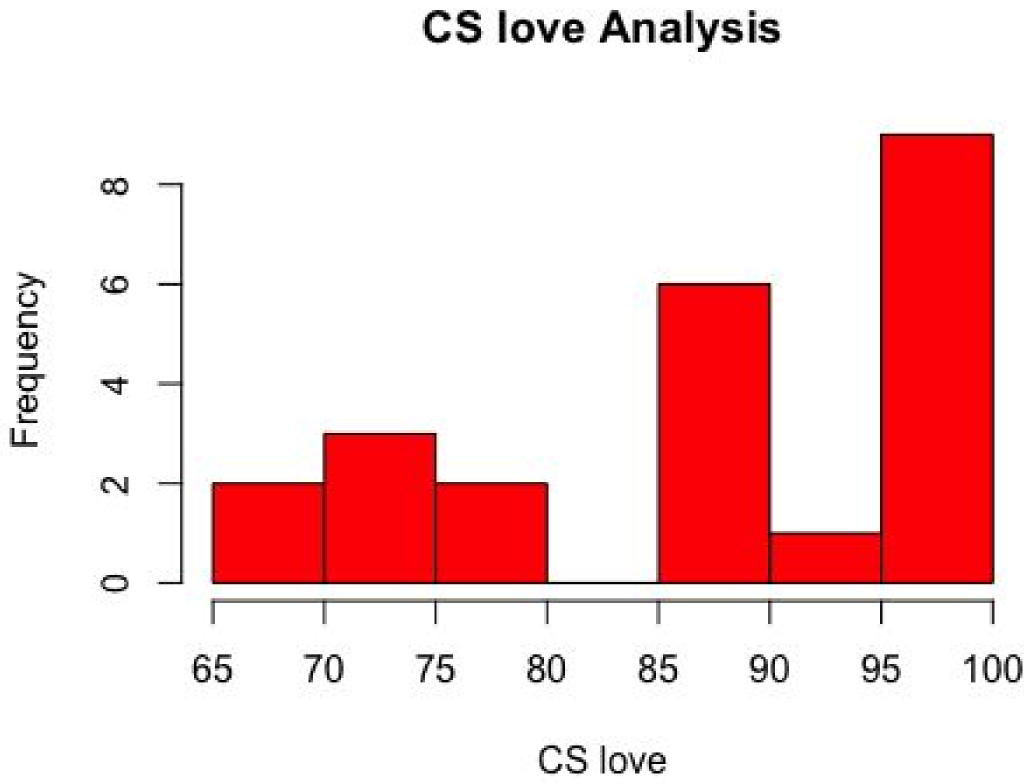


This shows that on an average there will 0 to 400 friends connected between each other on social networks.



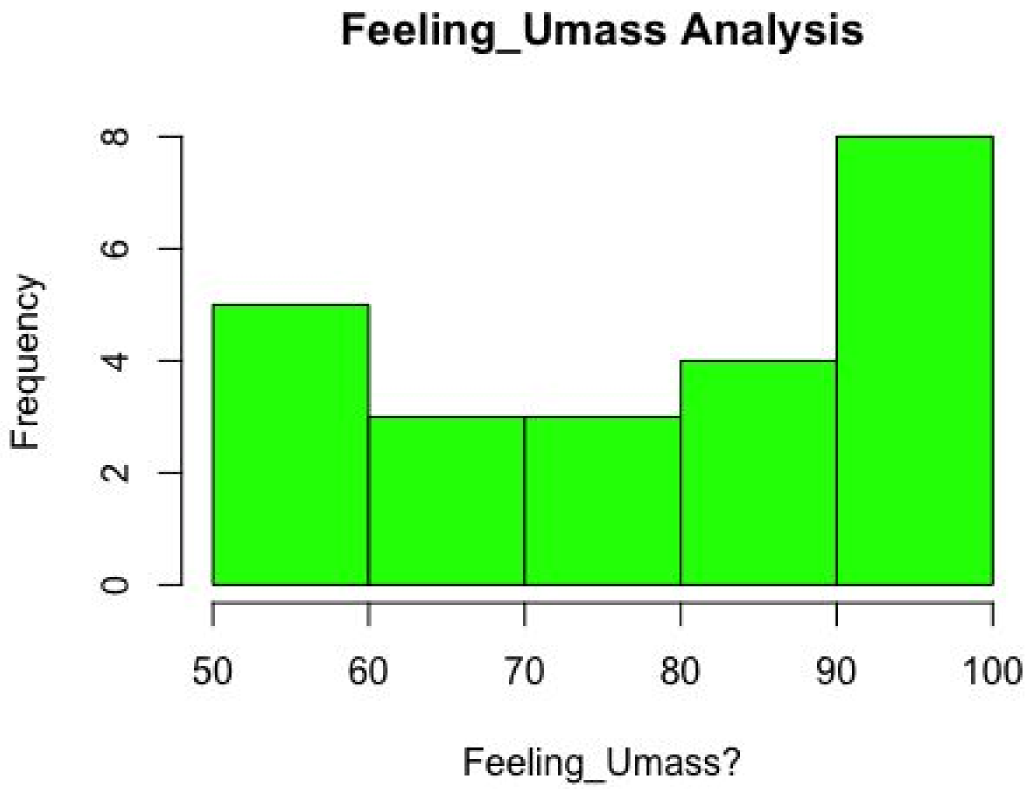
```
hist(hdd$Q15)
```

This histogram shows that both Mac and PC fans are almost equal.



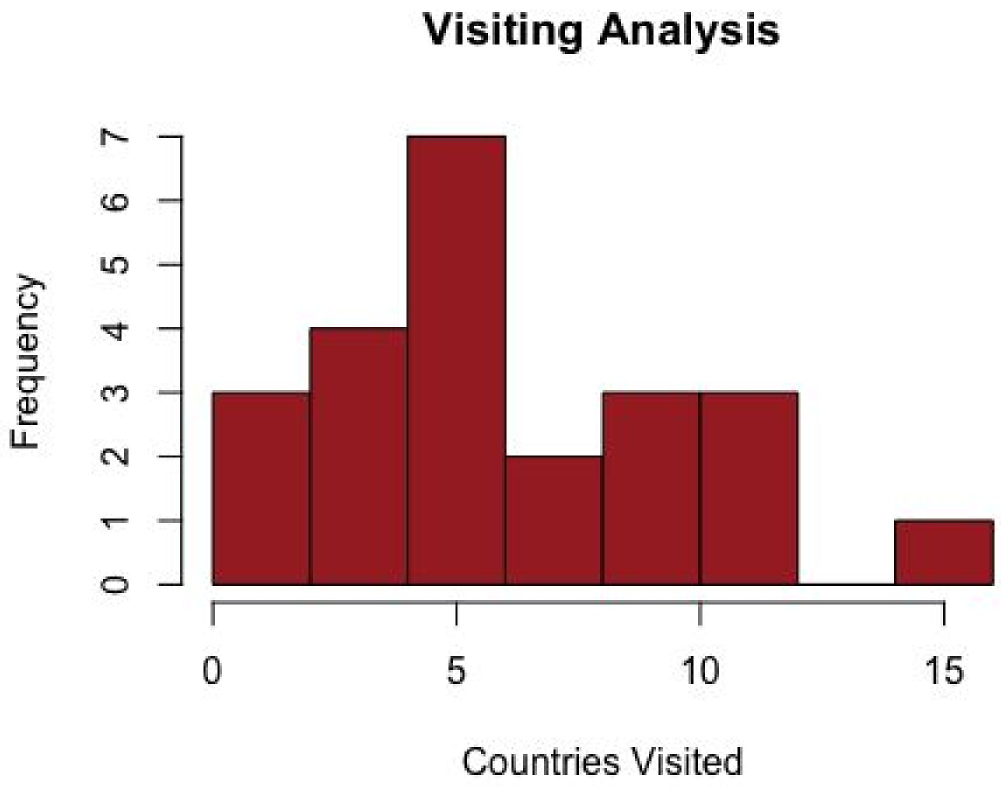
```
  hist(hdd$Q16)
```

This Histogram shows that majority of them love computer science.



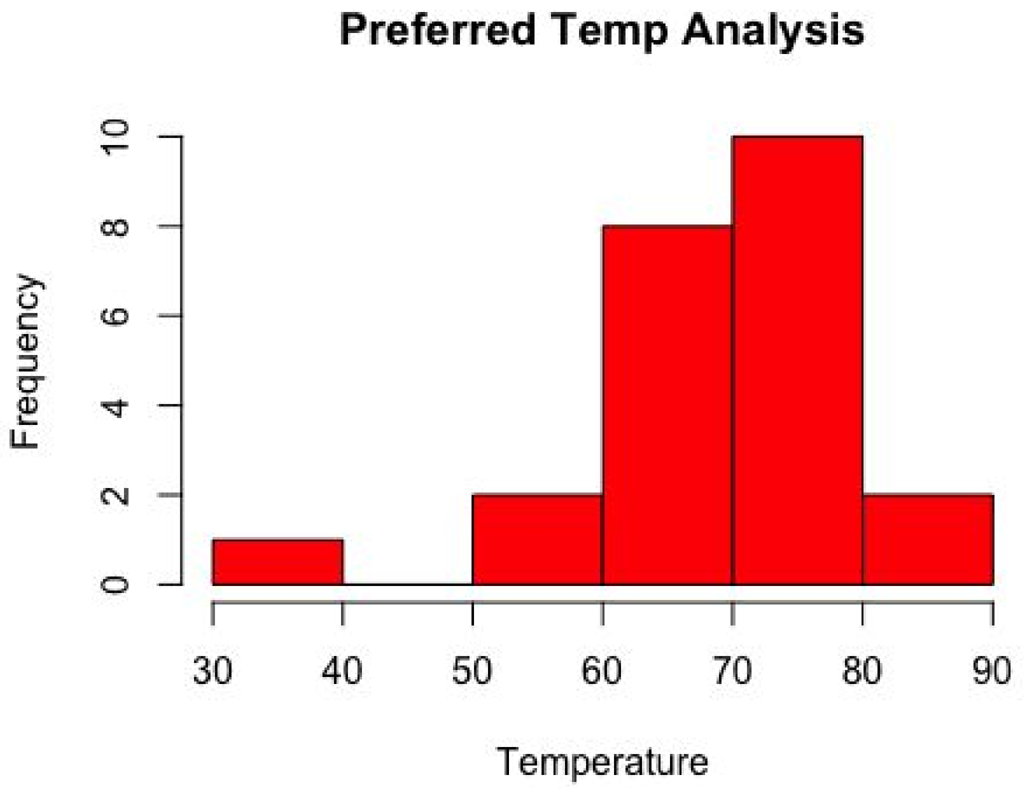
```
  hist(hdd$Q17)
```

```
the above histogram tells that most of the students love being at Umass in
the range 90-100.
```



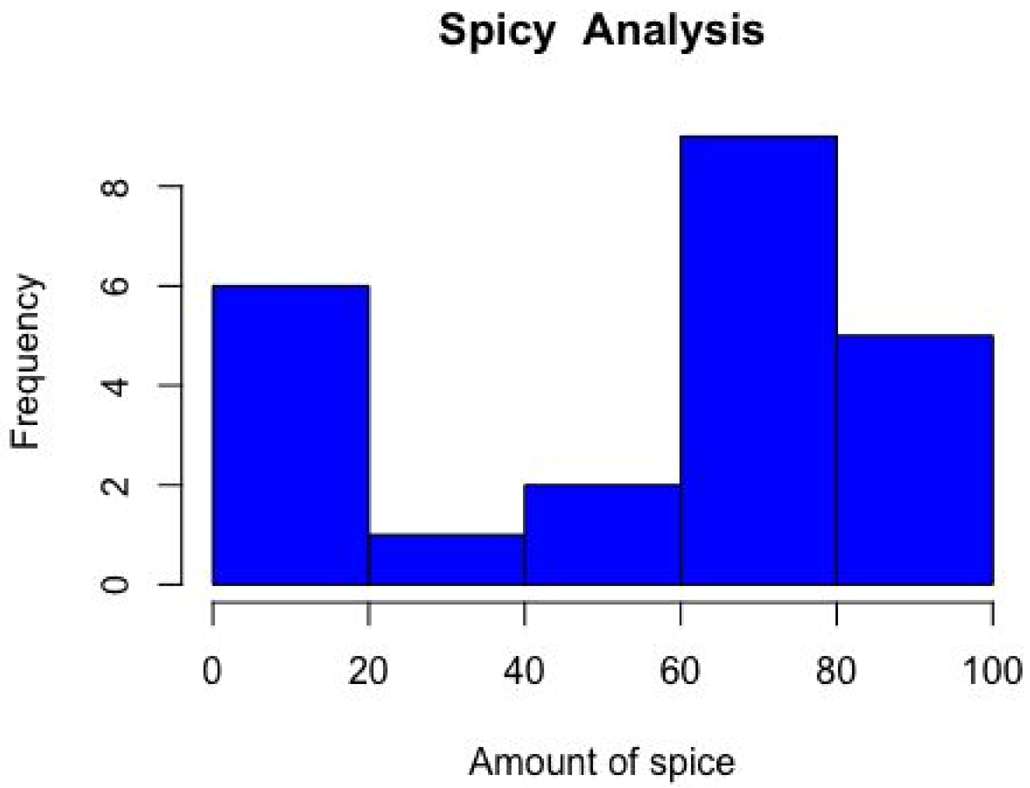
```
  hist(hdd$Q20)
```

This Histogram shows that a minimum of 3 countries visited by everyone.



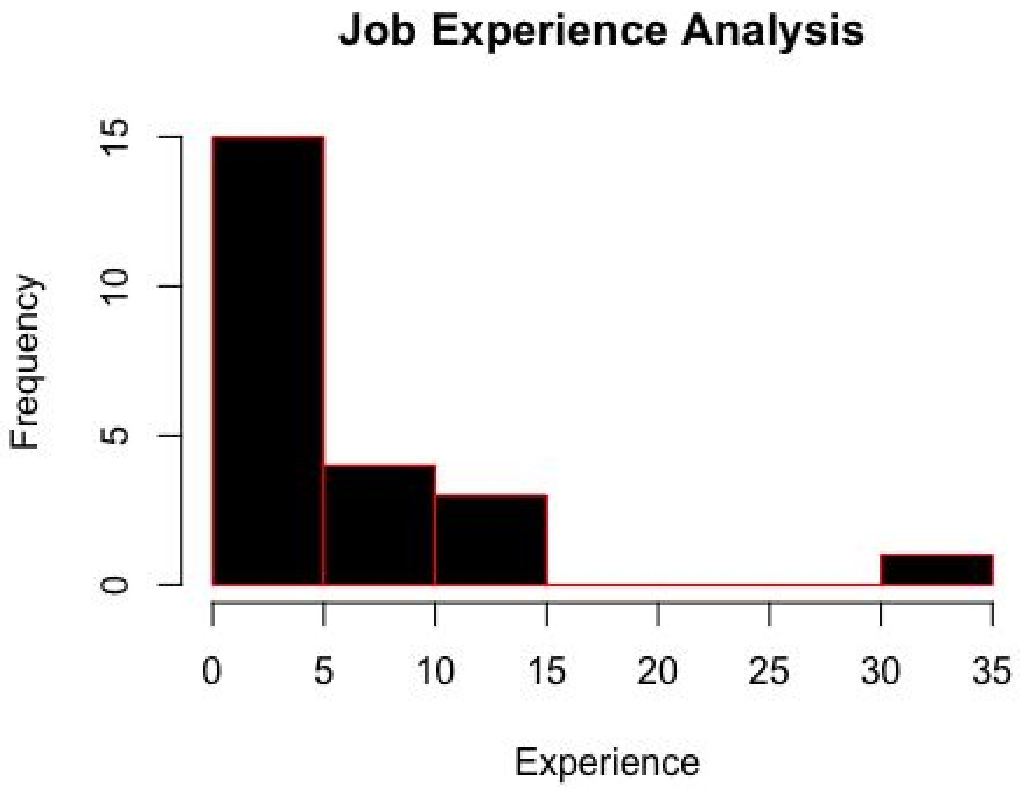
```
  hist(hdd$Q21)
```

From the Temperature analysis, it is seen most of the people like to be in the temperature range of 70F to 80F.



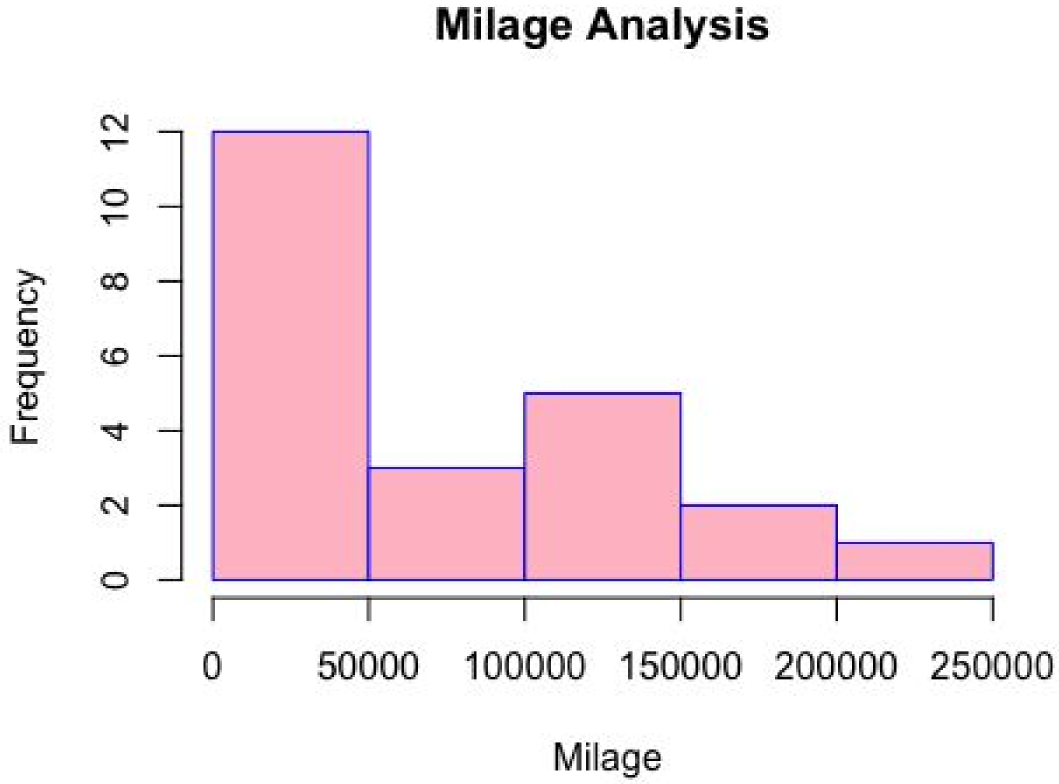
```
  hist(hdd$Q22)
```

Most of the people like moderate Spicy food ranging from 60-80.

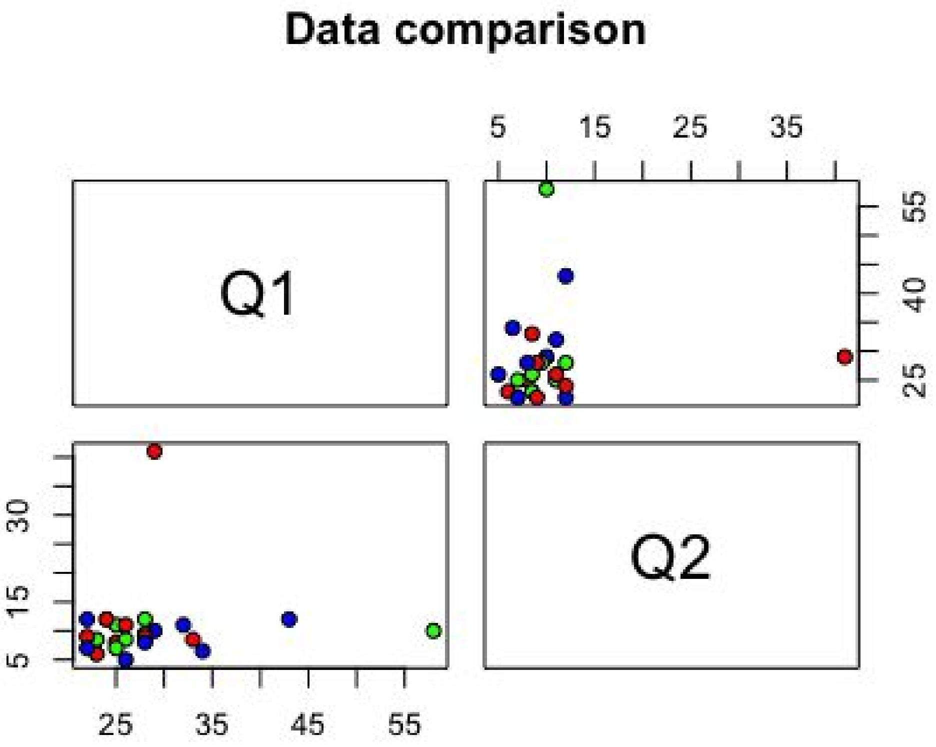


Job Experience Analysis
Frequency
0
5
10
15
0
5
10
15
20
25
30
35
Experience

```
hist(hdd$Q27)
```

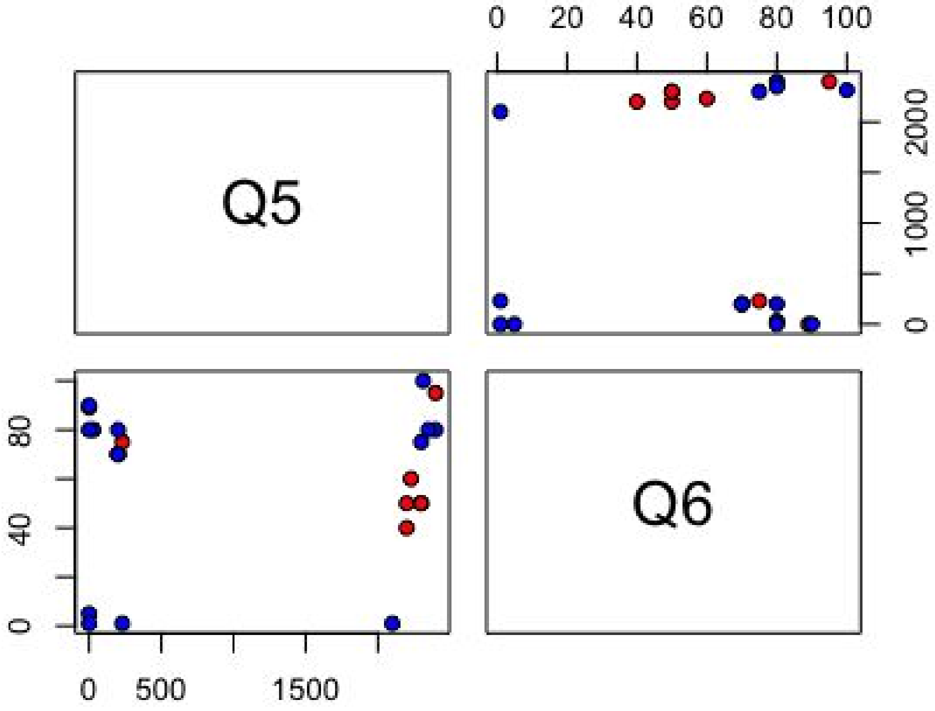

Milage Analysis
Frequency
0
2
4
6
8
10
12
0
50000
100000
150000
200000
250000
Milage

```
pairs(~Q1+Q2, data = hdd,  main = "Data comparison", pch= 21 , bg =
c("blue", "red", "green"))
```



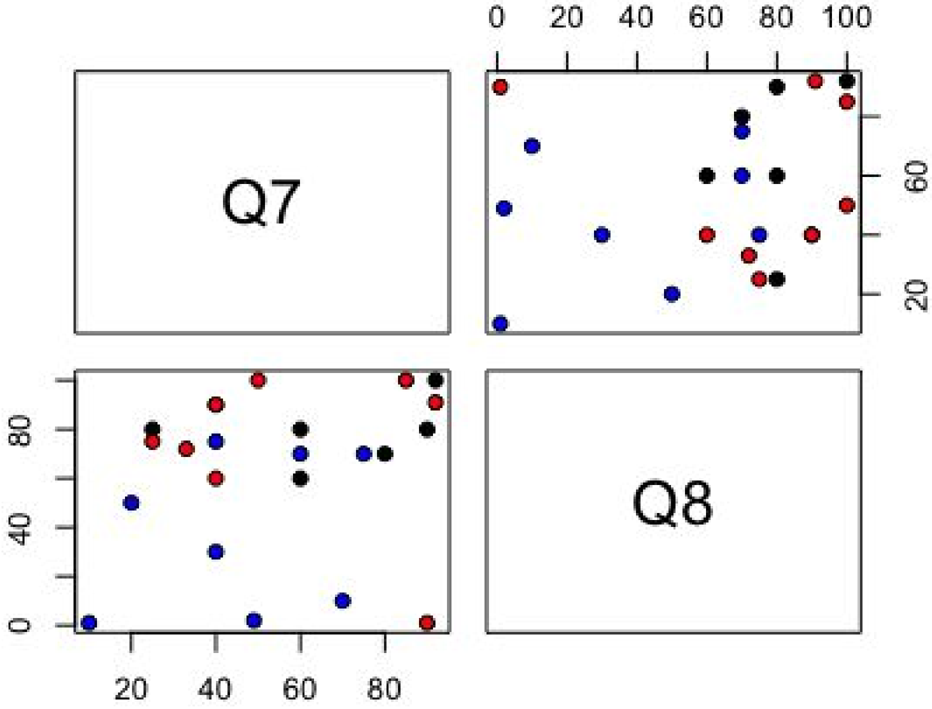
Here Q1 represents Age and Q2 Shoe size respectively. Note that there is more probability of small shoe size for small age as depicted in cluster of scattered plot.

```
pairs(~Q5+Q6, data = hdd,  pch= 21, bg = c("blue", "red", "blue"))
```

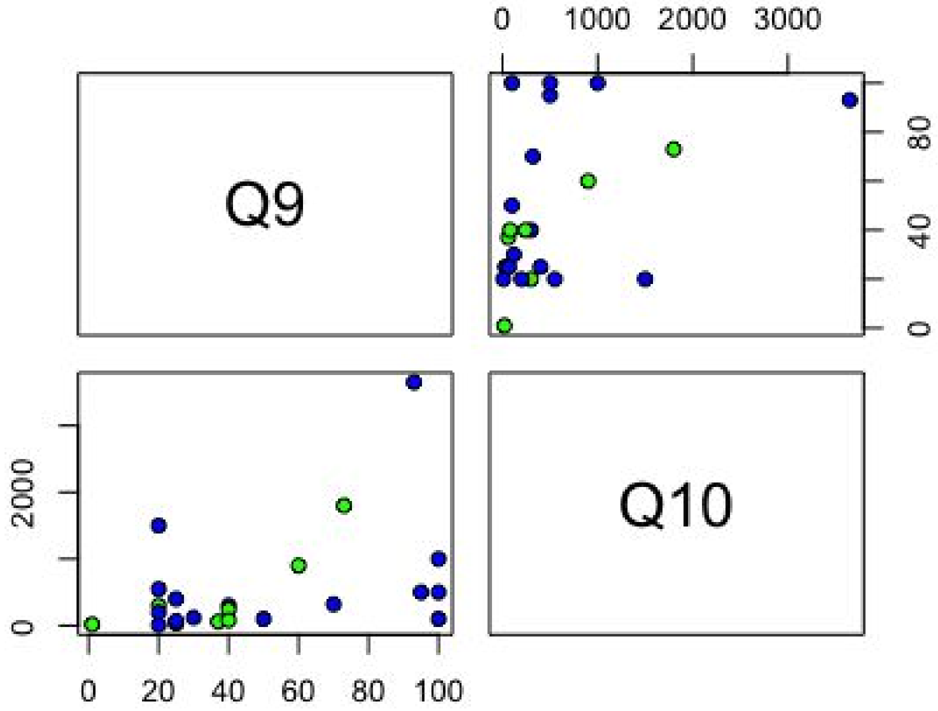


Q5 represents time to sleep and Q6 represents pet lover on scale. As we see there is hardly any cluster depicts there is very less probability of correlation between these two parameters in analysis.

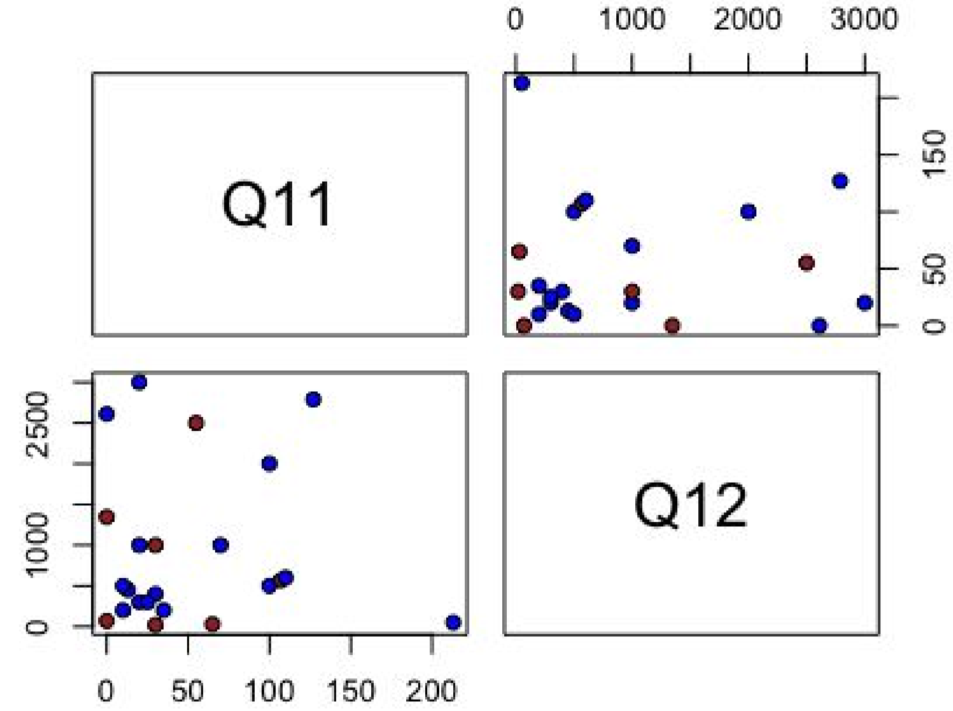
```
pairs(~Q7+Q8, data = hdd,  pch= 21, bg = c("blue", "red", "black"))
```



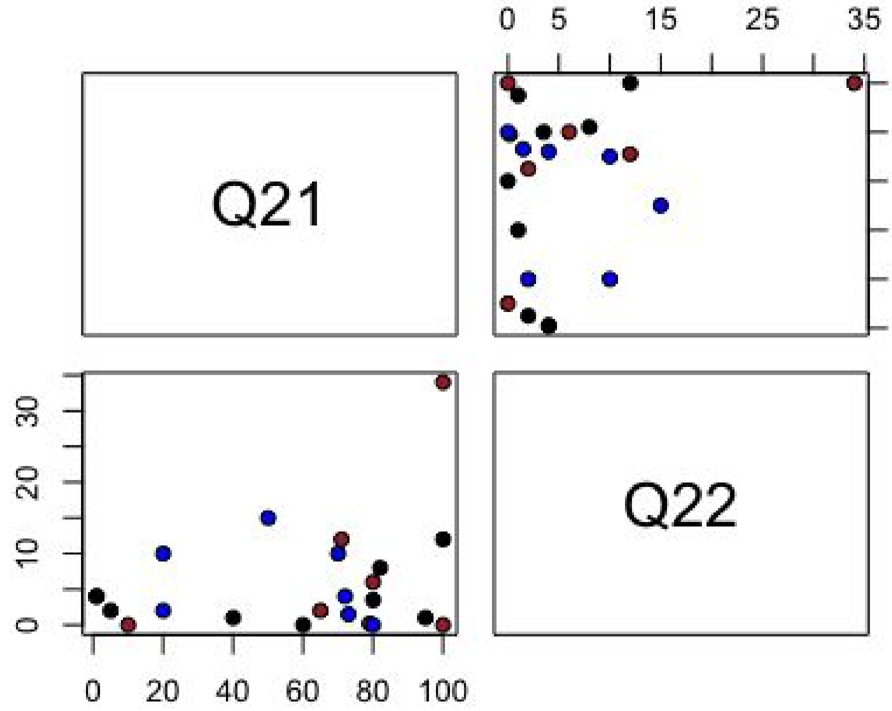
```
pairs(~Q9+Q10, data = hdd,  pch= 21, bg = c("blue", "blue", "green"))
```



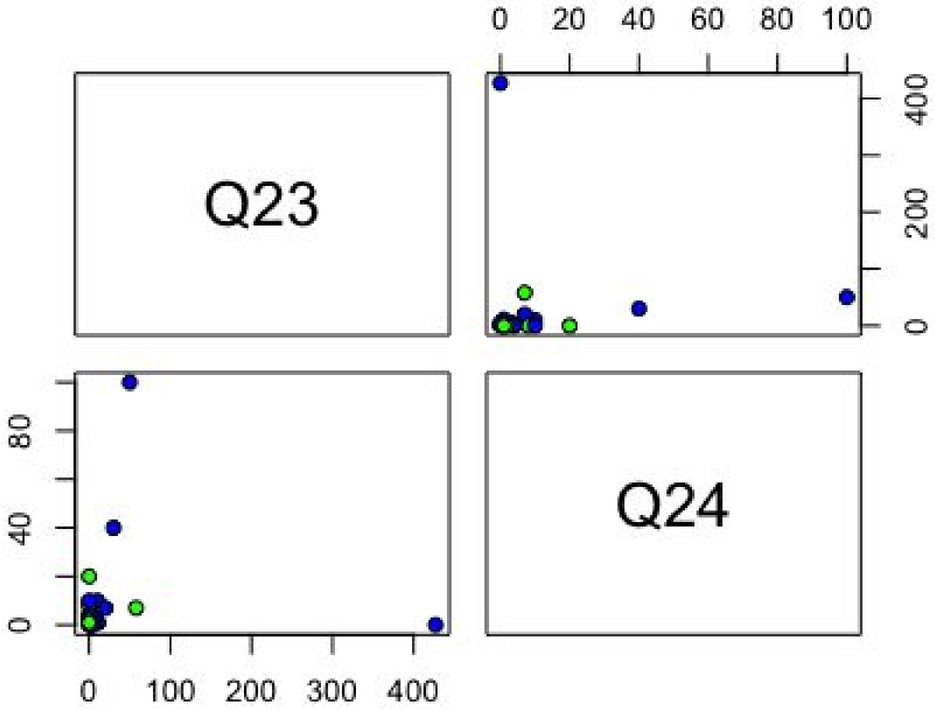
```
pairs(~Q11+Q12, data = hdd,  pch= 21, bg = c("blue", "blue", "brown"))
```



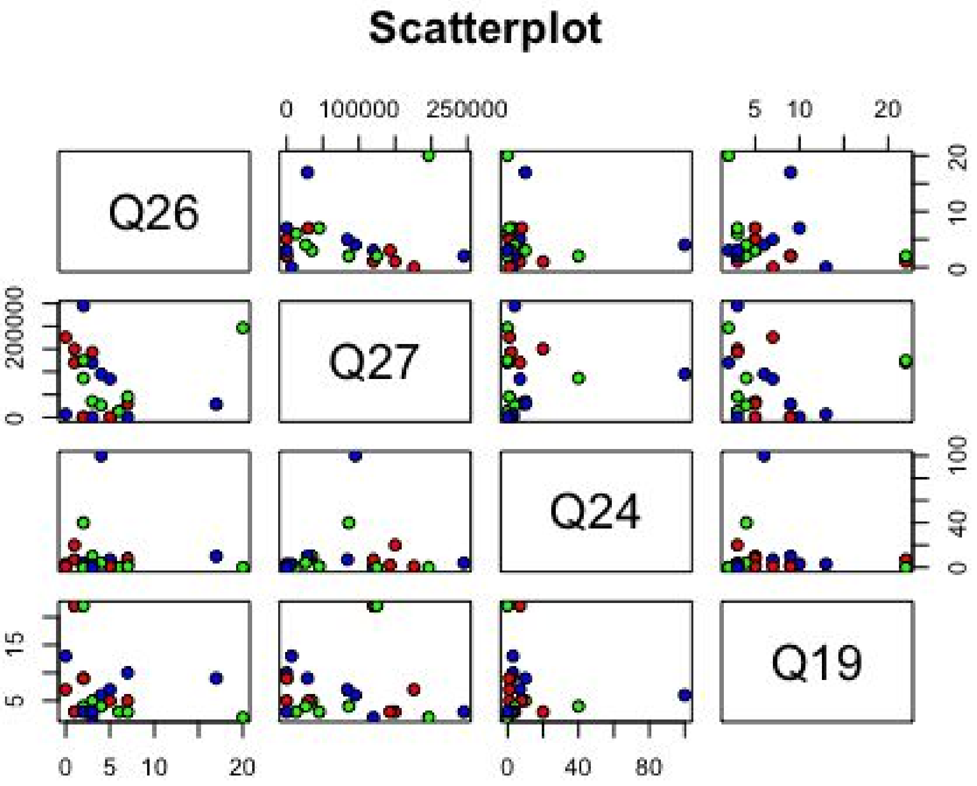
```
pairs(~Q21+Q22, data = hdd,  pch= 21, bg = c("blue", "black", "brown"))
```



```
pairs(~Q23+Q24, data = hdd,  pch= 21, bg = c("blue", "green", "blue"))
```

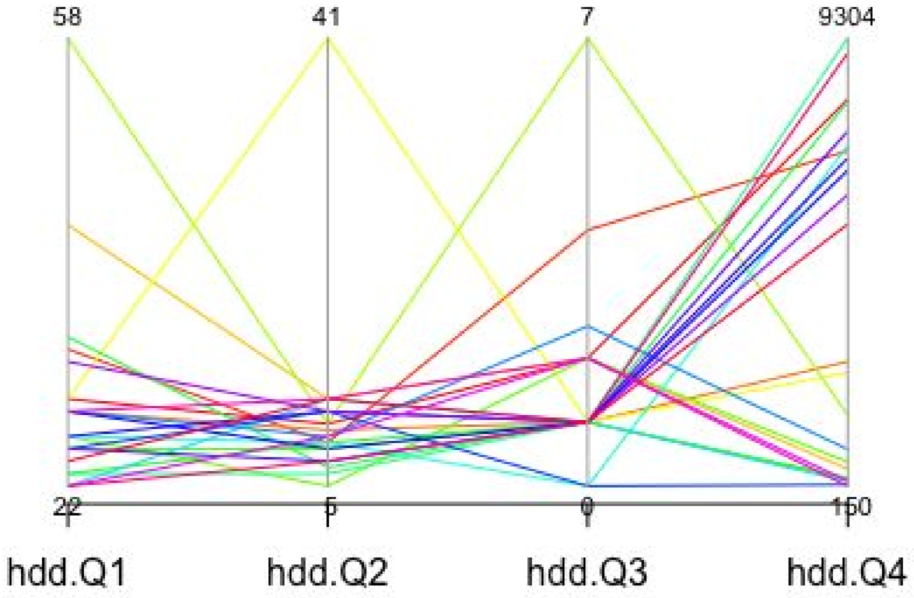


```
pairs(~Q26+Q27+Q24+Q19, data = hdd,  main= "Scatterplot",pch= 21, bg =
c("blue", "red", "green"))
```



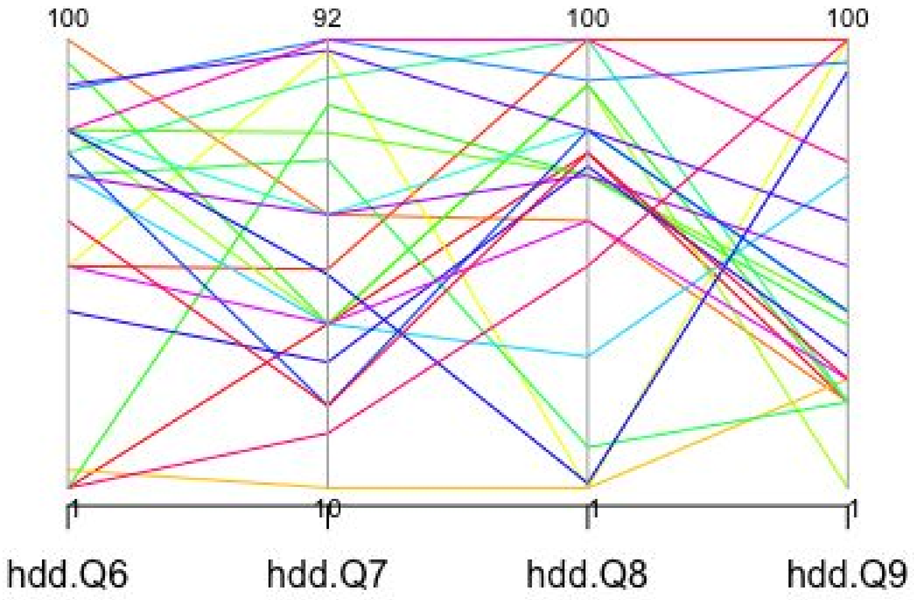
```
library(MASS)
pair1 <- data.frame(hdd$Q1, hdd$Q2, hdd$Q3, hdd$Q4)

parcoord(pair1, var.label = TRUE, col = rainbow(length(pair1[,1])))
#c("red","green", "blue"))
```



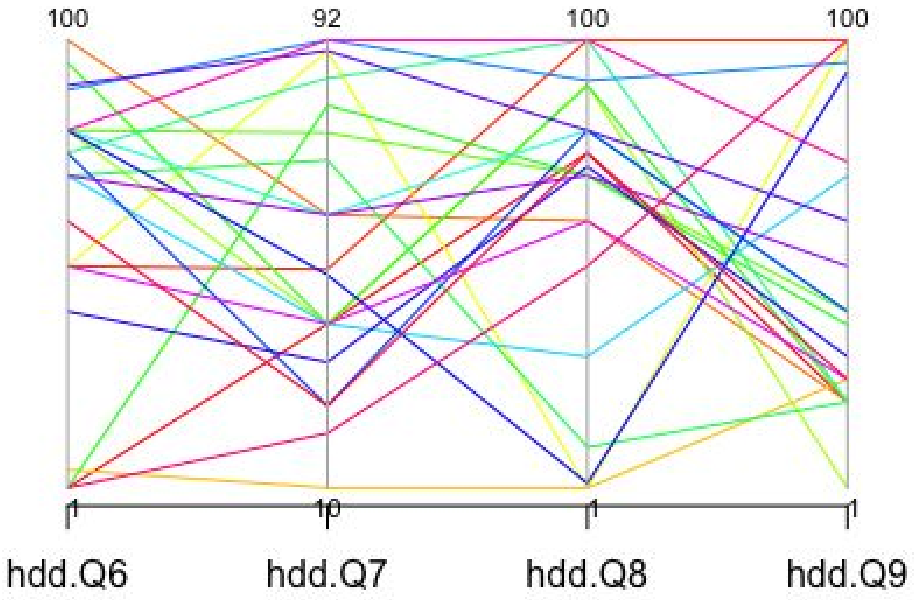
```
t<-data.frame(hdd$Q6, hdd$Q7, hdd$Q8, hdd$Q9)
#colnames("Pet lover", "Introvert/Extrovert", "Cook", " Money Saver")
#parcoord(t, col=rainbow(length(t[,1])), var.label=TRUE)

parcoord(t, var.label = TRUE, col = rainbow(length(t[,1])))
```



```
#c("red","green", "blue") )

t1<-data.frame(hdd$Q20, hdd$Q22, hdd$Q23, hdd$Q27)
parcoord(t, var.label = TRUE, col = rainbow(length(t1[,1])))
```



```
row.names(hdd) <- hdd[,1]
hdd1 <- hdd[,-1]
normalize <- scale(hdd1, scale=TRUE)
head(normalize)
```

```
##                 Q1          Q2         Q3         Q4         Q5
Q6
## Alex    0.04349035 -0.07824244  0.2846389  1.1776196  0.8548309
-1.9049899
## Ayat    0.54362936 -0.29419159  1.6628906  0.8750532  0.9445462
-0.3367477
## Bobby  -0.08154440 -0.15022549 -0.4044869 -0.3657570  1.0477188
1.2634995
## Chris   1.79397690  0.20968975  0.2846389 -0.9979766 -1.0291906
-1.7769701
## Elias   0.04349035  4.38470661 -0.4044869 -0.4312554  1.0342615
-0.3367477
## Harold  3.66949821 -0.07824244  3.7302681 -0.6810023 -1.0022761
0.6234006
##                Q7         Q8         Q9        Q10        Q11
Q12
## Alex   -0.5935306  0.3586387 -0.8863245 -0.6603888 -0.5991015
```

```
0.07058334
## Ayat   -0.1989871  1.1281059  1.6460312  0.5406538  0.9109626
-0.44741819
## Bobby   0.1955563 -0.1030417 -0.8863245 -0.3085682 -0.4103435
-0.94469965
## Chris  -1.7771609 -1.9189845 -0.7280523 -0.6361253  0.3446885
0.07058334
## Elias   1.3791866 -1.9189845  1.6460312 -0.5512031 -0.7878595
-0.75821910
## Harold -0.5935306  0.8203190 -1.4877590 -0.6482571  0.2503095
-0.93433962
##               Q13        Q14        Q15        Q16        Q17
Q18
## Alex    1.1948527  1.1096729 0.97477565 -1.6542721 -0.3784090
0.03974396
## Ayat   -0.6558742 -1.7439709 0.97477565  1.0595837 -1.4023392
-1.20677100
## Bobby  -0.2016049  0.4684046 0.97477565  1.0595837  0.1335561
0.70455193
## Chris  -1.1269683  1.3982436 0.07074985  0.5168125  0.1335561
2.61587487
## Elias  -0.4876263 -1.7439709 0.97477565  1.0595837  0.9015038
-0.54196303
## Harold -1.1572530 -0.1728636 0.97477565  1.0595837  0.9015038
2.69897587
##               Q19         Q20       Q21        Q22         Q23
Q24
## Alex    0.5536930  0.10685384 -1.724062 -0.2286354 -0.25283162
-0.31232993
## Ayat    0.3743277 -0.98542982  1.225367  0.8178551 -0.28670615
-0.35867566
## Bobby  -0.3431337 -3.53409167  1.225367 -0.7518807 -0.19637408
0.01209019
## Chris  -0.1637683  0.37992475 -0.264244  1.2102891  0.25528630
4.18320598
## Elias  -0.7018643 -0.07519344 -1.724062 -0.2286354 -0.30928917
0.47554750
## Harold -0.5224990  0.83504294  1.225367  3.6957042  0.02945611
1.40246212
##               Q25        Q26        Q27
## Alex   -0.2653021  0.4902266 -1.0297044
## Ayat   -1.0577629 -0.5347926 -1.0297044
## Bobby   0.9233891 -0.3297888 -0.5492659
## Chris   0.9233891 -0.1247850  0.2743429
## Elias  -1.0577629 -0.7397965  1.0293176
## Harold -1.2955012 -0.5347926  0.1508016
```

Q3 Below is normalized data columns.

Also we can see here are the insights that we can draw from the normalized data that represents the values as distance between two persons.

```
aa <- dist(normalize, method = "euclidean", diag = FALSE, upper = FALSE)
print(aa)
```

```
##                 Alex      Ayat     Bobby     Chris     Elias    Harold
## Ayat        7.081259                                                  
## Bobby       7.132254  6.672798                                        
## Chris       8.099717  9.591771  8.557536                              
## Elias       8.404103  8.161979  8.336198  9.528454                    
## Harold      9.807577  8.585894  9.513487  7.591897 10.856015          
## Jessica     5.423777  6.761043  5.591036  8.347032  8.089530 10.009185
## Lauren      5.458503  6.100273  5.175505  7.929764  7.983310  8.599683
## Luke        6.500680  6.982805  6.225259  8.027256  8.557779 10.061631
## Manjula     5.783260  6.555485  6.071308  7.557627  8.433576  8.759948
## Manpreet    5.998123  5.709198  5.921135  9.668146  8.700588  9.779337
## David       4.229962  5.969088  5.796540  8.545341  7.053541  9.698909
## Michael     7.522507  7.663266  7.234314  8.295266  8.158642  9.824892
## Nino        7.324890  6.696555  7.477909  8.939331  8.825268  9.384535
## Nathan      6.093882  6.753545  6.601508  8.845222  7.724745  9.925909
## Neda        8.406100  8.967689  9.038122  9.211299 10.186744 11.452956
## Patric      3.604155  5.973367  6.333908  8.128201  7.170609  9.580970
## Priyanka    8.077307  9.190068  8.795337 10.292246  9.654203 10.782895
## Abdelhamid  5.999680  6.471333  6.435202  8.298486  6.750905  9.017079
## Sheriff     4.992051  7.426456  6.480438  8.576085  8.208652 10.050842
## Special     8.887918  8.916798  8.627911  9.669321  9.932237 10.217758
## Sruthi      6.814386  5.995489  7.967705  9.290619  8.598325 11.250092
## John        5.684607  6.418547  6.238563  8.349653  6.631934  9.287143
##              Jessica    Lauren      Luke   Manjula  Manpreet     David
## Ayat                                                                  
## Bobby                                                                 
## Chris                                                                 
## Elias                                                                 
## Harold                                                                
## Jessica                                                               
## Lauren      4.329426                                                  
## Luke        5.826314  5.745993                                        
## Manjula     6.197691  5.504934  6.063826                              
## Manpreet    5.750066  4.681386  6.449141  5.367192                    
## David       4.300300  3.584483  6.293567  5.279875  4.388672          
## Michael     7.435158  6.273908  5.240318  6.424638  7.663434  6.778874
## Nino        5.850056  6.334607  6.104530  6.917877  6.879508  6.775898
## Nathan      5.782968  3.747085  5.320529  6.672849  6.467621  4.794061
## Neda        7.744923  8.170769  8.133352  7.635958  8.002346  8.056700
## Patric      5.231969  4.372397  5.665883  5.696587  5.704007  3.069190
## Priyanka    7.388739  7.144261  8.166806  6.799575  6.644834  7.419318
## Abdelhamid  5.188847  5.440832  6.815207  6.004772  5.234062  4.684327
## Sheriff     5.187242  4.362625  5.712199  6.753121  6.257178  5.170504
## Special     7.438358  7.925571  8.433107  8.638172  8.217954  8.512909
## Sruthi      6.391592  6.756158  6.112619  7.222264  6.140584  6.178490
## John        5.816082  4.522847  6.270725  6.516247  6.052672  4.394771
##              Michael      Nino    Nathan      Neda    Patric  Priyanka
## Ayat
## Bobby
## Chris
## Elias
## Harold
## Jessica
## Lauren
## Luke
## Manjula
## Manpreet
## David
## Michael
## Nino        6.042761
## Nathan      5.934213  6.828701
## Neda        7.457429  7.096589  8.870789
## Patric      6.328146  6.786514  4.172949  8.018905
## Priyanka    7.572228  7.395270  8.295173  8.406801  8.650352
## Abdelhamid  6.898763  6.690272  6.377795  8.800831  5.706180  6.770119
## Sheriff     5.238897  6.386962  4.541168  8.626762  4.971908  7.374285
## Special     9.150708  6.120952  8.869344  7.936528  8.515540  9.105634
## Sruthi      7.643622  7.418543  6.501392  7.976100  6.131437  8.092368
## John        5.797240  6.790495  4.328141  8.065627  3.454866  7.784032
##            Abdelhamid    Sheriff   Special    Sruthi
## Ayat
## Bobby
## Chris
## Elias
## Harold
## Jessica
## Lauren
## Luke
## Manjula
## Manpreet
## David
## Michael
## Nino
## Nathan
## Neda
## Patric
## Priyanka
## Abdelhamid
## Sheriff      5.549136
## Special      8.178914  8.968400
## Sruthi       6.615520  7.145691  9.592108
## John         4.994213  4.943915  8.171835  6.593794
```

```
#as.dist(normalize, diag = FALSE, upper = FALSE)
```

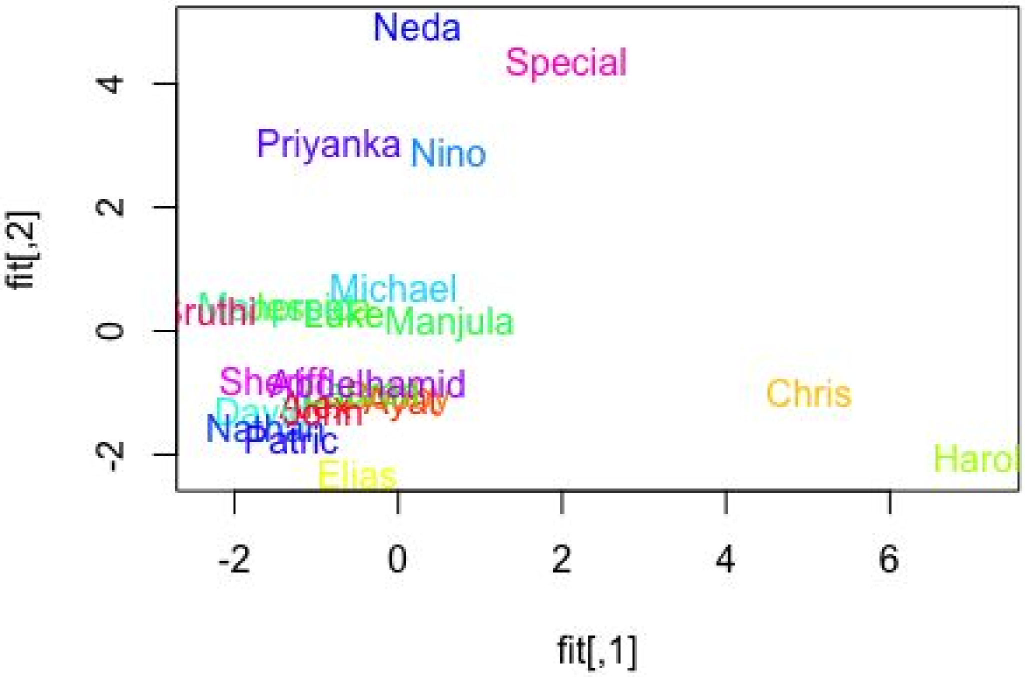
Multidimensional scaling (**MDS**) is a means of visualizing the level of similarity of individual cases of a dataset. It refers to a set of related ordination techniques used in information visualization, in particular to display the information contained in a distance matrix. Here we can observe that Ayat and Alex have greater distance and low similarity while

Shruti and Harold have maximum difference in behaviour after normalization while **John and David** have the least.

```
fit <- cmdscale(aa, k=2)
#print(fit)

plot(fit,type="n")

text(fit[,1], fit[,2], labels(aa), col = rainbow(length(fit[,1])))
```



Q4.

As we see in deviation in principal component analysis suggest similar elements(person) to be across similar variance and the larger the distance, the more is the differences in behaviour. Below are the plots that suggests results associated.

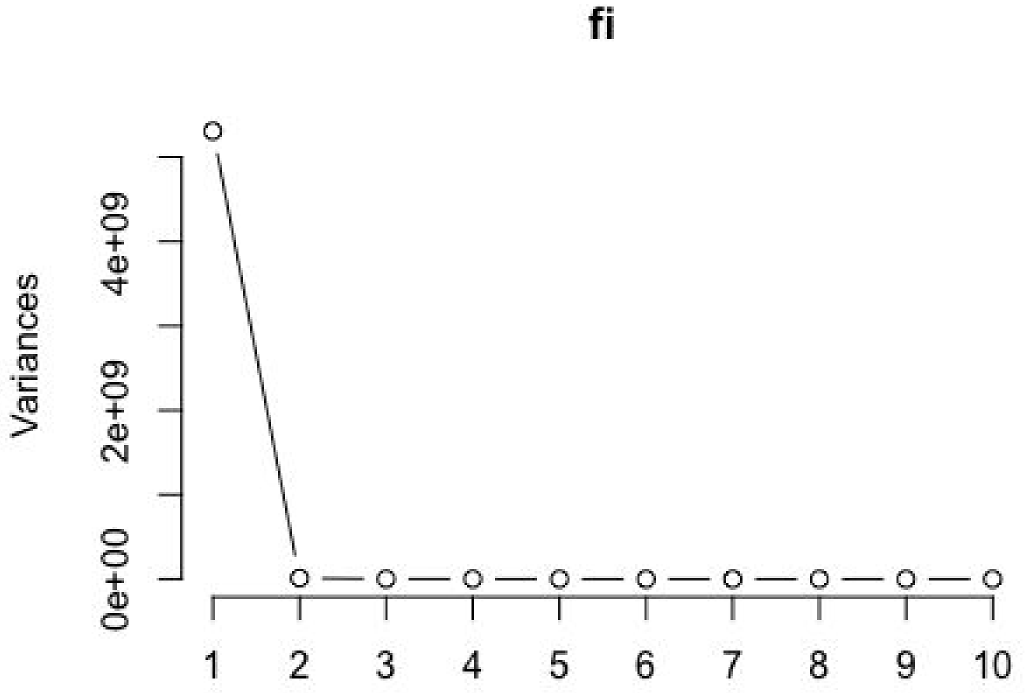
```
fi <- prcomp(hdd1)
summary(fi) # print variance accounted for
```

```
## Importance of components:
##                              PC1       PC2       PC3       PC4       PC5
## Standard deviation     7.286e+04 3.354e+03 1259.5770 841.08615 620.43074
## Proportion of Variance 9.974e-01 2.110e-03    0.0003   0.00013   0.00007
## Cumulative Proportion  9.974e-01 9.995e-01    0.9998   0.99991   0.99999
##                              PC6   PC7   PC8   PC9  PC10 PC11 PC12  PC13
## Standard deviation     242.05782 79.37 39.98 39.07 32.73 25.2 23.4 16.04
## Proportion of Variance   0.00001  0.00  0.00  0.00  0.00  0.0  0.0  0.00
## Cumulative Proportion    1.00000  1.00  1.00  1.00  1.00  1.0  1.0  1.00
##                         PC14  PC15  PC16  PC17  PC18  PC19  PC20  PC21
## Standard deviation     15.47 9.927 7.871 6.973 5.125 4.789 3.445 1.802
## Proportion of Variance  0.00 0.000 0.000 0.000 0.000 0.000 0.000 0.000
## Cumulative Proportion   1.00 1.000 1.000 1.000 1.000 1.000 1.000 1.000
##                         PC22      PC23
## Standard deviation     1.606 3.271e-13
## Proportion of Variance 0.000 0.000e+00
## Cumulative Proportion  1.000 1.000e+00
```

```
loadings(fi) # pc loadings
```

```
## NULL
```

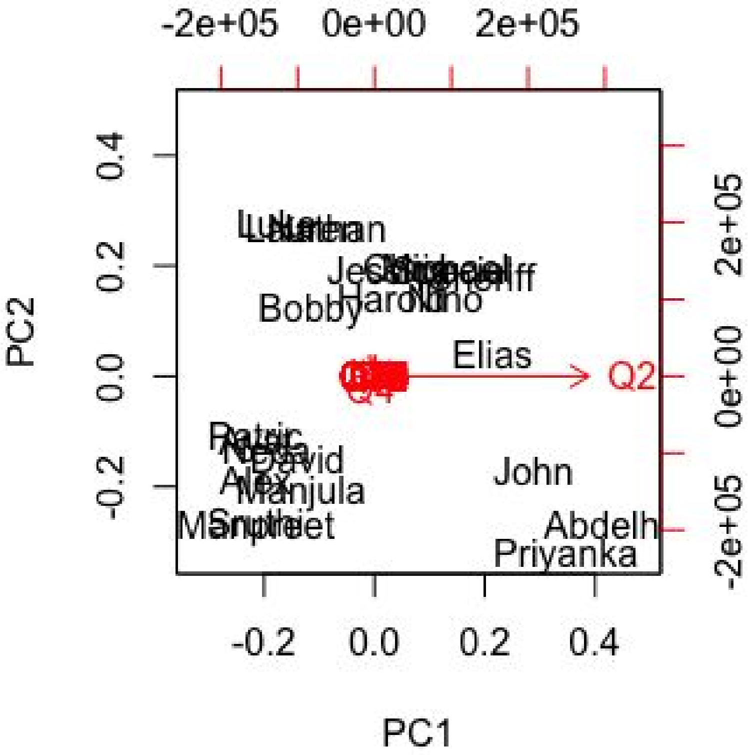
```
plot(fi,type="lines") # scree plot
```



```
fi$scores # the principal components
```

```
## NULL
```

```
biplot(fi)
```



All group members contributed equally to the assignment.