Part 1 and Part 2

Defining the question

You are a Data analyst at Carrefour Kenya and are currently undertaking a project that will inform the marketing department on the most relevant marketing strategies that will result in the highest no. of sales (total price including tax). Your project has been divided into four parts where you'll explore a recent marketing dataset by performing various unsupervised learning techniques and later providing recommendations based on your insights.

Metric Of Success

1. Perform Dimensionality Reduction using t-SNE algorithm or PCA.
2. Perform feature selection through the use of the unsupervised learning methods.

Context

Carrefour is a French group, and a leading global retailer. They have over 321,000 employees throughout the world with turnover of almost €80.7 billion in 2019, over half of which was generated outside France, Carrefour today has 12,225 stores in over 30 countries. Though due to some factors, they would like to increase their sales through a specific marketing strategy.

Data Preparation

```
install.packages("FactoMineR")
```

Import the libraries

```
## Installing package into '/home/greg/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)

## also installing the dependencies 'curl', 'rio', 'car'

## Warning in install.packages("FactoMineR"): installation of package 'curl' had
## non-zero exit status

## Warning in install.packages("FactoMineR"): installation of package 'rio' had
## non-zero exit status

## Warning in install.packages("FactoMineR"): installation of package 'car' had
## non-zero exit status
```

```
## Warning in install.packages("FactoMineR"): installation of package 'FactoMineR'
## had non-zero exit status
```

```
install.packages("tidyverse")
```

```
## Installing package into '/home/greg/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)

## also installing the dependencies 'gargle', 'curl', 'ids', 'openssl', 'googledrive', 'googlesheets4',

## Warning in install.packages("tidyverse"): installation of package 'curl' had
## non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'openssl' had
## non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'xml2' had
## non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'ids' had non-
## zero exit status

## Warning in install.packages("tidyverse"): installation of package 'httr' had
## non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'gargle' had
## non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'rvest' had
## non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'googledrive'
## had non-zero exit status

## Warning in install.packages("tidyverse"): installation of package
## 'googlesheets4' had non-zero exit status

## Warning in install.packages("tidyverse"): installation of package 'tidyverse'
## had non-zero exit status
```

```
install.packages("factoextra")
```

```
## Installing package into '/home/greg/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)

## also installing the dependencies 'curl', 'rio', 'car', 'rstatix', 'FactoMineR', 'ggpubr'

## Warning in install.packages("factoextra"): installation of package 'curl' had
## non-zero exit status
```

```
## Warning in install.packages("factoextra"): installation of package 'rio' had
## non-zero exit status

## Warning in install.packages("factoextra"): installation of package 'car' had
## non-zero exit status

## Warning in install.packages("factoextra"): installation of package 'rstatix' had
## non-zero exit status

## Warning in install.packages("factoextra"): installation of package 'FactoMineR'
## had non-zero exit status

## Warning in install.packages("factoextra"): installation of package 'ggpubr' had
## non-zero exit status

## Warning in install.packages("factoextra"): installation of package 'factoextra'
## had non-zero exit status
```

```
df <- read.csv('http://bit.ly/CarreFourDataset')
head(df)
```

I'll then load the dataset

```
##    Invoice.ID Branch Customer.type Gender           Product.line Unit.price
## 1 750-67-8428      A        Member Female      Health and beauty      74.69
## 2 226-31-3081      C        Normal Female Electronic accessories      15.28
## 3 631-41-3108      A        Normal   Male     Home and lifestyle      46.33
## 4 123-19-1176      A        Member   Male      Health and beauty      58.22
## 5 373-73-7910      A        Normal   Male      Sports and travel      86.31
## 6 699-14-3026      C        Normal   Male Electronic accessories      85.39
##   Quantity     Tax      Date  Time     Payment   cogs gross.margin.percentage
## 1        7 26.1415  1/5/2019 13:08     Ewallet 522.83                4.761905
## 2        5  3.8200  3/8/2019 10:29        Cash  76.40                4.761905
## 3        7 16.2155  3/3/2019 13:23 Credit card 324.31                4.761905
## 4        8 23.2880 1/27/2019 20:33     Ewallet 465.76                4.761905
## 5        7 30.2085  2/8/2019 10:37     Ewallet 604.17                4.761905
## 6        7 29.8865 3/25/2019 18:30     Ewallet 597.73                4.761905
##   gross.income Rating    Total
## 1      26.1415    9.1 548.9715
## 2       3.8200    9.6  80.2200
## 3      16.2155    7.4 340.5255
## 4      23.2880    8.4 489.0480
## 5      30.2085    5.3 634.3785
## 6      29.8865    4.1 627.6165
```

```
colnames(df, do.NULL = TRUE, prefix = "col")
```

I'll then check for column names in the dataset

```
##  [1] "Invoice.ID"              "Branch"
##  [3] "Customer.type"           "Gender"
##  [5] "Product.line"            "Unit.price"
##  [7] "Quantity"                "Tax"
##  [9] "Date"                    "Time"
## [11] "Payment"                 "cogs"
## [13] "gross.margin.percentage" "gross.income"
## [15] "Rating"                  "Total"
```

```
sum(is.na(df))
```

I'll then check for nulls in the dataset

```
## [1] 0
```

The output shows no null values

```
sum(duplicated(df))
```

I'll then check for duplicates in the dataset

```
## [1] 0
```

The output shows no duplicates

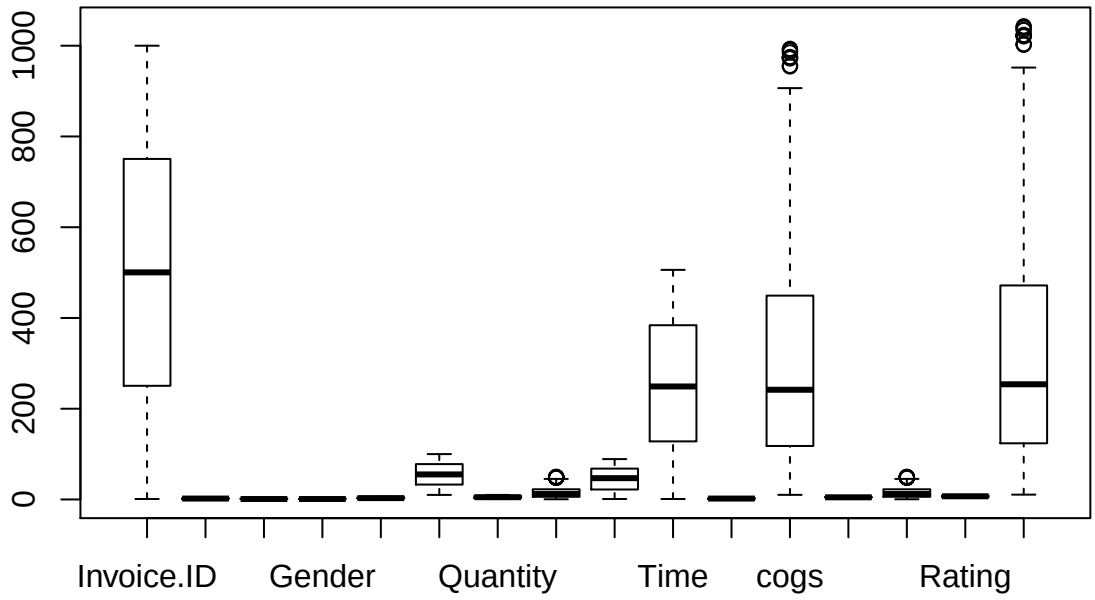
```
str(df)
```

Check the internal structute

```
## 'data.frame':    1000 obs. of  16 variables:
##  $ Invoice.ID            : Factor w/ 1000 levels "101-17-6199",..: 815 143 654 19 340 734 316 265 70
##  $ Branch                : Factor w/ 3 levels "A","B","C": 1 3 1 1 1 3 1 3 1 2 ...
##  $ Customer.type         : Factor w/ 2 levels "Member","Normal": 1 2 2 1 2 2 1 2 1 1 ...
##  $ Gender                : Factor w/ 2 levels "Female","Male": 1 1 2 2 2 2 1 1 1 1 ...
##  $ Product.line          : Factor w/ 6 levels "Electronic accessories",..: 4 1 5 4 6 1 1 5 4 3 ...
##  $ Unit.price            : num  74.7 15.3 46.3 58.2 86.3 ...
##  $ Quantity              : int  7 5 7 8 7 7 6 10 2 3 ...
##  $ Tax                   : num  26.14 3.82 16.22 23.29 30.21 ...
##  $ Date                  : Factor w/ 89 levels "1/1/2019","1/10/2019",..: 27 88 82 20 58 77 49 48 2
##  $ Time                  : Factor w/ 506 levels "10:00","10:01",..: 147 24 156 486 30 394 215 78 342
##  $ Payment               : Factor w/ 3 levels "Cash","Credit card",..: 3 1 2 3 3 3 3 3 2 2 ...
##  $ cogs                  : num  522.8 76.4 324.3 465.8 604.2 ...
##  $ gross.margin.percentage: num  4.76 4.76 4.76 4.76 4.76 ...
##  $ gross.income          : num  26.14 3.82 16.22 23.29 30.21 ...
##  $ Rating                : num  9.1 9.6 7.4 8.4 5.3 4.1 5.8 8 7.2 5.9 ...
##  $ Total                 : num  549 80.2 340.5 489 634.4 ...
```

EDA

```
boxplot(df)
```

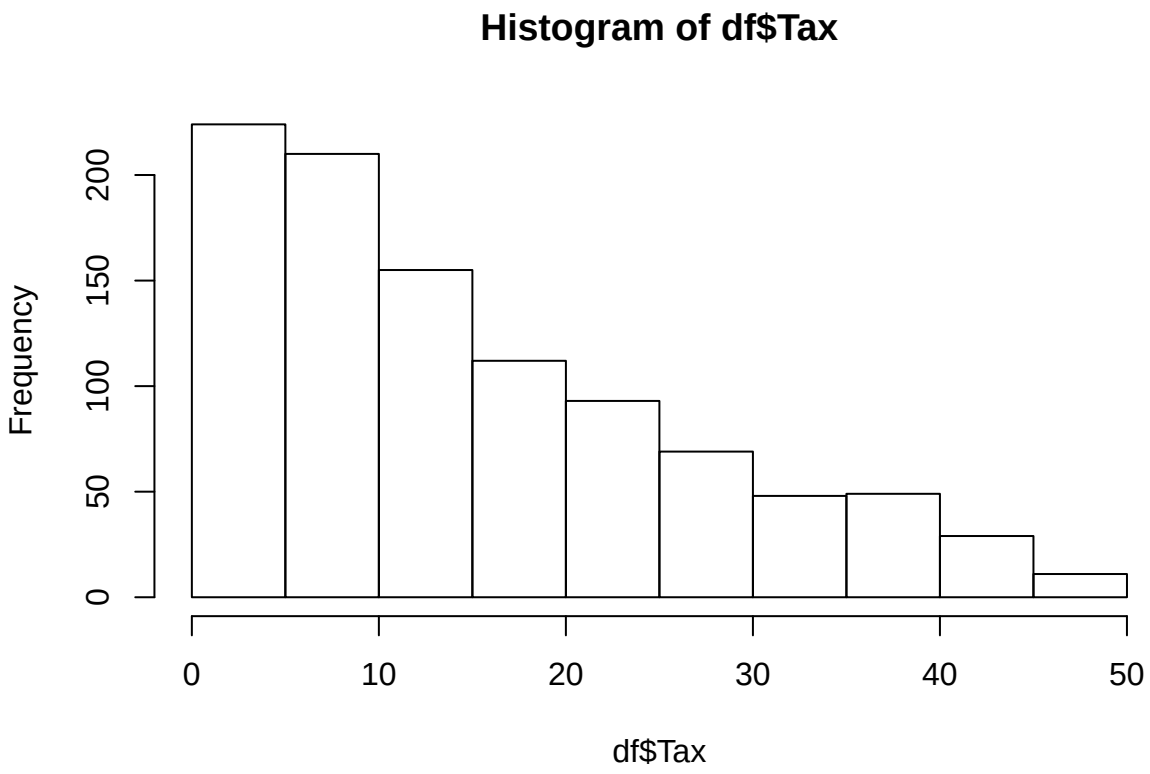


Their is presence of outliers though we are not going to drop them as they seem reasonable.

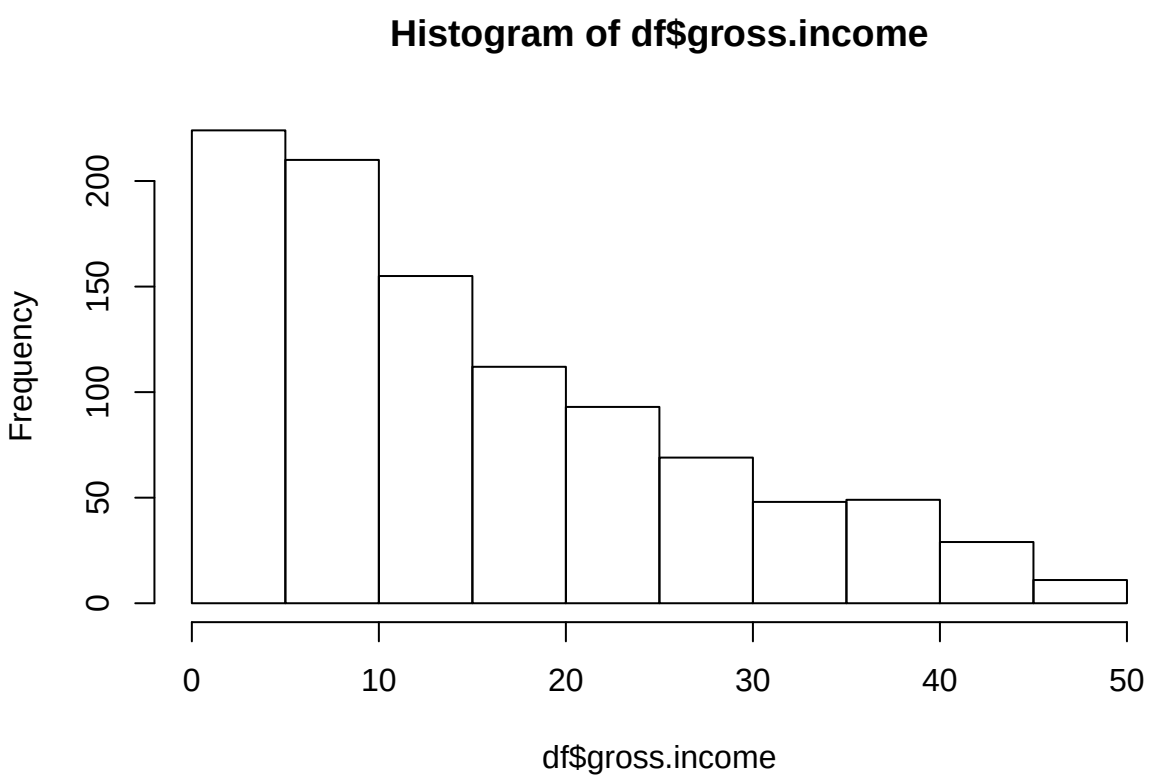
```
hist(df$Total)
```

Show various distribution in the dataset

```
hist(df$Tax)
```




```
hist(df$gross.income)
```




```
num <- data.matrix(data.frame(unclass(df)))
head(num)
```

Inorder to check for co-orelation I'll convert to numeric

```
##      Invoice.ID Branch Customer.type Gender Product.line Unit.price Quantity
## [1,]        815      1             1      1            4      74.69        7
## [2,]        143      3             2      1            1      15.28        5
## [3,]        654      1             2      2            5      46.33        7
## [4,]         19      1             1      2            4      58.22        8
## [5,]        340      1             2      2            6      86.31        7
## [6,]        734      3             2      2            1      85.39        7
##          Tax Date Time Payment   cogs gross.margin.percentage gross.income
## [1,] 26.1415   27  147       3 522.83                4.761905      26.1415
## [2,]  3.8200   88   24       1  76.40                4.761905       3.8200
## [3,] 16.2155   82  156       2 324.31                4.761905      16.2155
## [4,] 23.2880   20  486       3 465.76                4.761905      23.2880
## [5,] 30.2085   58   30       3 604.17                4.761905      30.2085
## [6,] 29.8865   77  394       3 597.73                4.761905      29.8865
##      Rating    Total
## [1,]    9.1 548.9715
## [2,]    9.6  80.2200
## [3,]    7.4 340.5255
```

```
## [4,]    8.4 489.0480
## [5,]    5.3 634.3785
## [6,]    4.1 627.6165
```

```
install.packages("corrplot")
```

I'll then check for co-orelation in the dataset

```
## Installing package into '/home/greg/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)
```

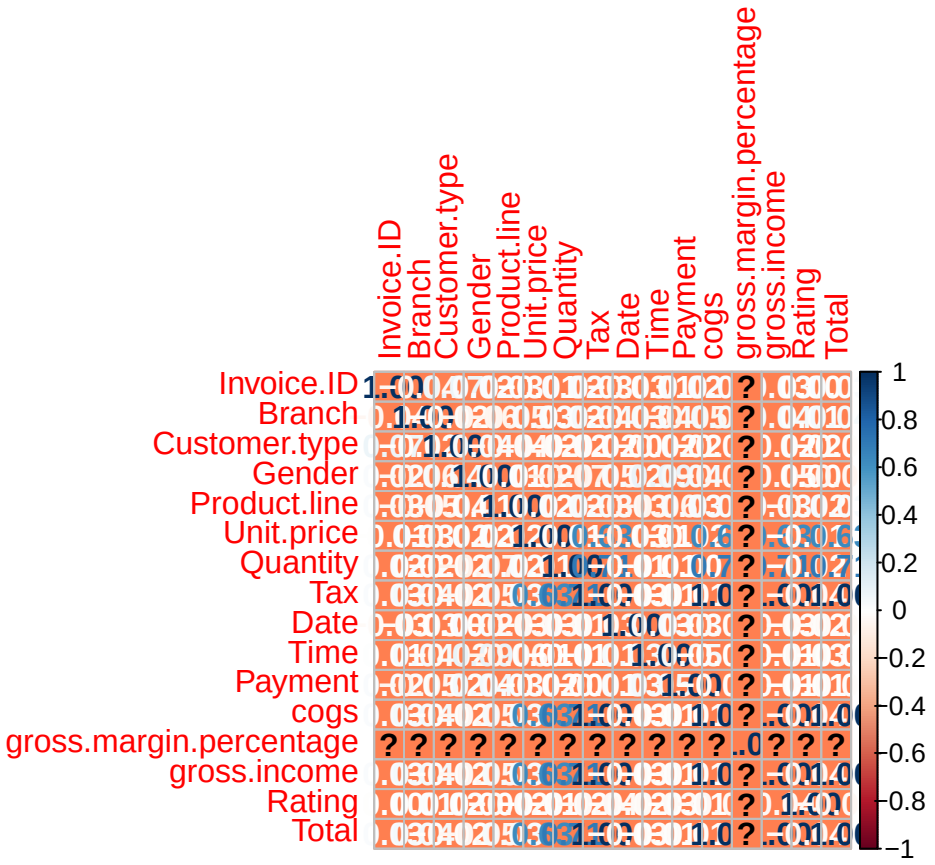
```
library(corrplot)
```

```
## corrplot 0.90 loaded
```

```
correlation <- cor(num, method = "pearson")
```

```
## Warning in cor(num, method = "pearson"): the standard deviation is zero
```

```
options(repr.plot.width=12, repr.plot.height=12)
corrplot(correlation, diag=TRUE, method="number", bg="coral",)
```



```
mean(df$Total)
```

Ill then get the mean of the total spent

```
## [1] 322.9667
```

```
mean(df$gross.income)
```

I'll then get the mean of the gross.income

```
## [1] 15.37937
```

PCA

```
install.packages("dplyr")
```

I'll then select numeric columns

```
## Installing package into '/home/greg/R/x86_64-pc-linux-gnu-library/3.6'
## (as 'lib' is unspecified)
```

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
df1 <- select_if(df, is.numeric)
```

```
df1 = df1[,c(-4, -10)]
names(df1)
```

```
## [1] "Unit.price"              "Quantity"
## [3] "Tax"                     "gross.margin.percentage"
## [5] "gross.income"            "Rating"
## [7] "Total"
```

```r
# Dropping the unecessary Date and Time columns.
df1 = df1[,c(-9,-10)]
names(df1)
```

```
## [1] "Unit.price"              "Quantity"
## [3] "Tax"                     "gross.margin.percentage"
## [5] "gross.income"            "Rating"
## [7] "Total"
```

```r
select(df1,-c(gross.margin.percentage))
```

I'll then drop the gross margin in the dataset

```
##      Unit.price Quantity     Tax gross.income Rating     Total
## 1         74.69        7 26.1415      26.1415    9.1  548.9715
## 2         15.28        5  3.8200       3.8200    9.6   80.2200
## 3         46.33        7 16.2155      16.2155    7.4  340.5255
## 4         58.22        8 23.2880      23.2880    8.4  489.0480
## 5         86.31        7 30.2085      30.2085    5.3  634.3785
## 6         85.39        7 29.8865      29.8865    4.1  627.6165
## 7         68.84        6 20.6520      20.6520    5.8  433.6920
## 8         73.56       10 36.7800      36.7800    8.0  772.3800
## 9         36.26        2  3.6260       3.6260    7.2   76.1460
## 10        54.84        3  8.2260       8.2260    5.9  172.7460
## 11        14.48        4  2.8960       2.8960    4.5   60.8160
## 12        25.51        4  5.1020       5.1020    6.8  107.1420
## 13        46.95        5 11.7375      11.7375    7.1  246.4875
## 14        43.19       10 21.5950      21.5950    8.2  453.4950
## 15        71.38       10 35.6900      35.6900    5.7  749.4900
## 16        93.72        6 28.1160      28.1160    4.5  590.4360
## 17        68.93        7 24.1255      24.1255    4.6  506.6355
## 18        72.61        6 21.7830      21.7830    6.9  457.4430
## 19        54.67        3  8.2005       8.2005    8.6  172.2105
## 20        40.30        2  4.0300       4.0300    4.4   84.6300
## 21        86.04        5 21.5100      21.5100    4.8  451.7100
## 22        87.98        3 13.1970      13.1970    5.1  277.1370
## 23        33.20        2  3.3200       3.3200    4.4   69.7200
## 24        34.56        5  8.6400       8.6400    9.9  181.4400
## 25        88.63        3 13.2945      13.2945    6.0  279.1845
## 26        52.59        8 21.0360      21.0360    8.5  441.7560
## 27        33.52        1  1.6760       1.6760    6.7   35.1960
## 28        87.67        2  8.7670       8.7670    7.7  184.1070
## 29        88.36        5 22.0900      22.0900    9.6  463.8900
## 30        24.89        9 11.2005      11.2005    7.4  235.2105
## 31        94.13        5 23.5325      23.5325    4.8  494.1825
## 32        78.07        9 35.1315      35.1315    4.5  737.7615
## 33        83.78        8 33.5120      33.5120    5.1  703.7520
## 34        96.58        2  9.6580       9.6580    5.1  202.8180
## 35        99.42        4 19.8840      19.8840    7.5  417.5640
## 36        68.12        1  3.4060       3.4060    6.8   71.5260
```

```
## 37       62.62        5 15.6550      15.6550    7.0  328.7550
## 38       60.88        9 27.3960      27.3960    4.7  575.3160
## 39       54.92        8 21.9680      21.9680    7.6  461.3280
## 40       30.12        8 12.0480      12.0480    7.7  253.0080
## 41       86.72        1  4.3360       4.3360    7.9   91.0560
## 42       56.11        2  5.6110       5.6110    6.3  117.8310
## 43       69.12        6 20.7360      20.7360    5.6  435.4560
## 44       98.70        8 39.4800      39.4800    7.6  829.0800
## 45       15.37        2  1.5370       1.5370    7.2   32.2770
## 46       93.96        4 18.7920      18.7920    9.5  394.6320
## 47       56.69        9 25.5105      25.5105    8.4  535.7205
## 48       20.01        9  9.0045       9.0045    4.1  189.0945
## 49       18.93        6  5.6790       5.6790    8.1  119.2590
## 50       82.63       10 41.3150      41.3150    7.9  867.6150
## 51       91.40        7 31.9900      31.9900    9.5  671.7900
## 52       44.59        5 11.1475      11.1475    8.5  234.0975
## 53       17.87        4  3.5740       3.5740    6.5   75.0540
## 54       15.43        1  0.7715       0.7715    6.1   16.2015
## 55       16.16        2  1.6160       1.6160    6.5   33.9360
## 56       85.98        8 34.3920      34.3920    8.2  722.2320
## 57       44.34        2  4.4340       4.4340    5.8   93.1140
## 58       89.60        8 35.8400      35.8400    6.6  752.6400
## 59       72.35       10 36.1750      36.1750    5.4  759.6750
## 60       30.61        6  9.1830       9.1830    9.3  192.8430
## 61       24.74        3  3.7110       3.7110   10.0   77.9310
## 62       55.73        6 16.7190      16.7190    7.0  351.0990
## 63       55.07        9 24.7815      24.7815   10.0  520.4115
## 64       15.81       10  7.9050       7.9050    8.6  166.0050
## 65       75.74        4 15.1480      15.1480    7.6  318.1080
## 66       15.87       10  7.9350       7.9350    5.8  166.6350
## 67       33.47        2  3.3470       3.3470    6.7   70.2870
## 68       97.61        6 29.2830      29.2830    9.9  614.9430
## 69       78.77       10 39.3850      39.3850    6.4  827.0850
## 70       18.33        1  0.9165       0.9165    4.3   19.2465
## 71       89.48       10 44.7400      44.7400    9.6  939.5400
## 72       62.12       10 31.0600      31.0600    5.9  652.2600
## 73       48.52        3  7.2780       7.2780    4.0  152.8380
## 74       75.91        6 22.7730      22.7730    8.7  478.2330
## 75       74.67        9 33.6015      33.6015    9.4  705.6315
## 76       41.65       10 20.8250      20.8250    5.4  437.3250
## 77       49.04        9 22.0680      22.0680    8.6  463.4280
## 78       20.01        9  9.0045       9.0045    5.7  189.0945
## 79       78.31       10 39.1550      39.1550    6.6  822.2550
## 80       20.38        5  5.0950       5.0950    6.0  106.9950
## 81       99.19        6 29.7570      29.7570    5.5  624.8970
## 82       96.68        3 14.5020      14.5020    6.4  304.5420
## 83       19.25        8  7.7000       7.7000    6.6  161.7000
## 84       80.36        4 16.0720      16.0720    8.3  337.5120
## 85       48.91        5 12.2275      12.2275    6.6  256.7775
## 86       83.06        7 29.0710      29.0710    4.0  610.4910
## 87       76.52        5 19.1300      19.1300    9.9  401.7300
## 88       49.38        7 17.2830      17.2830    7.3  362.9430
## 89       42.47        1  2.1235       2.1235    5.7   44.5935
## 90       76.99        6 23.0970      23.0970    6.1  485.0370
```

```
## 91       47.38        4  9.4760       9.4760    7.1  198.9960
## 92       44.86       10 22.4300      22.4300    8.2  471.0300
## 93       21.98        7  7.6930       7.6930    5.1  161.5530
## 94       64.36        9 28.9620      28.9620    8.6  608.2020
## 95       89.75        1  4.4875       4.4875    6.6   94.2375
## 96       97.16        1  4.8580       4.8580    7.2  102.0180
## 97       87.87       10 43.9350      43.9350    5.1  922.6350
## 98       12.45        6  3.7350       3.7350    4.1   78.4350
## 99       52.75        3  7.9125       7.9125    9.3  166.1625
## 100      82.70        6 24.8100      24.8100    7.4  521.0100
## 101      48.71        1  2.4355       2.4355    4.1   51.1455
## 102      78.55        9 35.3475      35.3475    7.2  742.2975
## 103      23.07        9 10.3815      10.3815    4.9  218.0115
## 104      58.26        6 17.4780      17.4780    9.9  367.0380
## 105      30.35        7 10.6225      10.6225    8.0  223.0725
## 106      88.67       10 44.3350      44.3350    7.3  931.0350
## 107      27.38        6  8.2140       8.2140    7.9  172.4940
## 108      62.13        6 18.6390      18.6390    7.4  391.4190
## 109      33.98        9 15.2910      15.2910    4.2  321.1110
## 110      81.97       10 40.9850      40.9850    9.2  860.6850
## 111      16.49        2  1.6490       1.6490    4.6   34.6290
## 112      98.21        3 14.7315      14.7315    7.8  309.3615
## 113      72.84        7 25.4940      25.4940    8.4  535.3740
## 114      58.07        9 26.1315      26.1315    4.3  548.7615
## 115      80.79        9 36.3555      36.3555    9.5  763.4655
## 116      27.02        3  4.0530       4.0530    7.1   85.1130
## 117      21.94        5  5.4850       5.4850    5.3  115.1850
## 118      51.36        1  2.5680       2.5680    5.2   53.9280
## 119      10.96       10  5.4800       5.4800    6.0  115.0800
## 120      53.44        2  5.3440       5.3440    4.1  112.2240
## 121      99.56        8 39.8240      39.8240    5.2  836.3040
## 122      57.12        7 19.9920      19.9920    6.5  419.8320
## 123      99.96        9 44.9820      44.9820    4.2  944.6220
## 124      63.91        8 25.5640      25.5640    4.6  536.8440
## 125      56.47        8 22.5880      22.5880    7.3  474.3480
## 126      93.69        7 32.7915      32.7915    4.5  688.6215
## 127      32.25        5  8.0625       8.0625    9.0  169.3125
## 128      31.73        9 14.2785      14.2785    5.9  299.8485
## 129      68.54        8 27.4160      27.4160    8.5  575.7360
## 130      90.28        9 40.6260      40.6260    7.2  853.1460
## 131      39.62        7 13.8670      13.8670    7.5  291.2070
## 132      92.13        6 27.6390      27.6390    8.3  580.4190
## 133      34.84        4  6.9680       6.9680    7.4  146.3280
## 134      87.45        6 26.2350      26.2350    8.8  550.9350
## 135      81.30        6 24.3900      24.3900    5.3  512.1900
## 136      90.22        3 13.5330      13.5330    6.2  284.1930
## 137      26.31        5  6.5775       6.5775    8.8  138.1275
## 138      34.42        6 10.3260      10.3260    9.8  216.8460
## 139      51.91       10 25.9550      25.9550    8.2  545.0550
## 140      72.50        8 29.0000      29.0000    9.2  609.0000
## 141      89.80       10 44.9000      44.9000    5.4  942.9000
## 142      90.50       10 45.2500      45.2500    8.1  950.2500
## 143      68.60       10 34.3000      34.3000    9.1  720.3000
## 144      30.41        1  1.5205       1.5205    8.4   31.9305
```

```
## 145       77.95        6 23.3850      23.3850    8.0  491.0850
## 146       46.26        6 13.8780      13.8780    9.5  291.4380
## 147       30.14       10 15.0700      15.0700    9.2  316.4700
## 148       66.14        4 13.2280      13.2280    5.6  277.7880
## 149       71.86        8 28.7440      28.7440    6.2  603.6240
## 150       32.46        8 12.9840      12.9840    4.9  272.6640
## 151       91.54        4 18.3080      18.3080    4.8  384.4680
## 152       34.56        7 12.0960      12.0960    7.3  254.0160
## 153       83.24        9 37.4580      37.4580    7.4  786.6180
## 154       16.48        6  4.9440       4.9440    9.9  103.8240
## 155       80.97        8 32.3880      32.3880    9.3  680.1480
## 156       92.29        5 23.0725      23.0725    9.0  484.5225
## 157       72.17        1  3.6085       3.6085    6.1   75.7785
## 158       50.28        5 12.5700      12.5700    9.7  263.9700
## 159       97.22        9 43.7490      43.7490    6.0  918.7290
## 160       93.39        6 28.0170      28.0170   10.0  588.3570
## 161       43.18        8 17.2720      17.2720    8.3  362.7120
## 162       63.69        1  3.1845       3.1845    6.0   66.8745
## 163       45.79        7 16.0265      16.0265    7.0  336.5565
## 164       76.40        2  7.6400       7.6400    6.5  160.4400
## 165       39.90       10 19.9500      19.9500    5.9  418.9500
## 166       42.57        8 17.0280      17.0280    5.6  357.5880
## 167       95.58       10 47.7900      47.7900    4.8 1003.5900
## 168       98.98       10 49.4900      49.4900    8.7 1039.2900
## 169       51.28        6 15.3840      15.3840    6.5  323.0640
## 170       69.52        7 24.3320      24.3320    8.5  510.9720
## 171       70.01        5 17.5025      17.5025    5.5  367.5525
## 172       80.05        5 20.0125      20.0125    9.4  420.2625
## 173       20.85        8  8.3400       8.3400    6.3  175.1400
## 174       52.89        6 15.8670      15.8670    9.8  333.2070
## 175       19.79        8  7.9160       7.9160    8.7  166.2360
## 176       33.84        9 15.2280      15.2280    8.8  319.7880
## 177       22.17        8  8.8680       8.8680    9.6  186.2280
## 178       22.51        7  7.8785       7.8785    4.8  165.4485
## 179       73.88        6 22.1640      22.1640    4.4  465.4440
## 180       86.80        3 13.0200      13.0200    9.9  273.4200
## 181       64.26        7 22.4910      22.4910    5.7  472.3110
## 182       38.47        8 15.3880      15.3880    7.7  323.1480
## 183       15.50       10  7.7500       7.7500    8.0  162.7500
## 184       34.31        8 13.7240      13.7240    5.7  288.2040
## 185       12.34        7  4.3190       4.3190    6.7   90.6990
## 186       18.08        3  2.7120       2.7120    8.0   56.9520
## 187       94.49        8 37.7960      37.7960    7.5  793.7160
## 188       46.47        4  9.2940       9.2940    7.0  195.1740
## 189       74.07        1  3.7035       3.7035    9.9   77.7735
## 190       69.81        4 13.9620      13.9620    5.9  293.2020
## 191       77.04        3 11.5560      11.5560    7.2  242.6760
## 192       73.52        2  7.3520       7.3520    4.6  154.3920
## 193       87.80        9 39.5100      39.5100    9.2  829.7100
## 194       25.55        4  5.1100       5.1100    5.7  107.3100
## 195       32.71        5  8.1775       8.1775    9.9  171.7275
## 196       74.29        1  3.7145       3.7145    5.0   78.0045
## 197       43.70        2  4.3700       4.3700    4.9   91.7700
## 198       25.29        1  1.2645       1.2645    6.1   26.5545
```

```
## 199       41.50        4  8.3000       8.3000    8.2  174.3000
## 200       71.39        5 17.8475      17.8475    5.5  374.7975
## 201       19.15        6  5.7450       5.7450    6.8  120.6450
## 202       57.49        4 11.4980      11.4980    6.6  241.4580
## 203       61.41        7 21.4935      21.4935    9.8  451.3635
## 204       25.90       10 12.9500      12.9500    8.7  271.9500
## 205       17.77        5  4.4425       4.4425    5.4   93.2925
## 206       23.03        9 10.3635      10.3635    7.9  217.6335
## 207       66.65        9 29.9925      29.9925    9.7  629.8425
## 208       28.53       10 14.2650      14.2650    7.8  299.5650
## 209       30.37        3  4.5555       4.5555    5.1   95.6655
## 210       99.73        9 44.8785      44.8785    6.5  942.4485
## 211       26.23        9 11.8035      11.8035    5.9  247.8735
## 212       93.26        9 41.9670      41.9670    8.8  881.3070
## 213       92.36        5 23.0900      23.0900    4.9  484.8900
## 214       46.42        3  6.9630       6.9630    4.4  146.2230
## 215       29.61        7 10.3635      10.3635    6.5  217.6335
## 216       18.28        1  0.9140       0.9140    8.3   19.1940
## 217       24.77        5  6.1925       6.1925    8.5  130.0425
## 218       94.64        3 14.1960      14.1960    5.5  298.1160
## 219       94.87        8 37.9480      37.9480    8.7  796.9080
## 220       57.34        3  8.6010       8.6010    7.9  180.6210
## 221       45.35        6 13.6050      13.6050    6.1  285.7050
## 222       62.08        7 21.7280      21.7280    5.4  456.2880
## 223       11.81        5  2.9525       2.9525    9.4   62.0025
## 224       12.54        1  0.6270       0.6270    8.2   13.1670
## 225       43.25        2  4.3250       4.3250    6.2   90.8250
## 226       87.16        2  8.7160       8.7160    9.7  183.0360
## 227       69.37        9 31.2165      31.2165    4.0  655.5465
## 228       37.06        4  7.4120       7.4120    9.7  155.6520
## 229       90.70        6 27.2100      27.2100    5.3  571.4100
## 230       63.42        8 25.3680      25.3680    7.4  532.7280
## 231       81.37        2  8.1370       8.1370    6.5  170.8770
## 232       10.59        3  1.5885       1.5885    8.7   33.3585
## 233       84.09        9 37.8405      37.8405    8.0  794.6505
## 234       73.82        4 14.7640      14.7640    6.7  310.0440
## 235       51.94       10 25.9700      25.9700    6.5  545.3700
## 236       93.14        2  9.3140       9.3140    4.1  195.5940
## 237       17.41        5  4.3525       4.3525    4.9   91.4025
## 238       44.22        5 11.0550      11.0550    8.6  232.1550
## 239       13.22        5  3.3050       3.3050    4.3   69.4050
## 240       89.69        1  4.4845       4.4845    4.9   94.1745
## 241       24.94        9 11.2230      11.2230    5.6  235.6830
## 242       59.77        2  5.9770       5.9770    5.8  125.5170
## 243       93.20        2  9.3200       9.3200    6.0  195.7200
## 244       62.65        4 12.5300      12.5300    4.2  263.1300
## 245       93.87        8 37.5480      37.5480    8.3  788.5080
## 246       47.59        8 19.0360      19.0360    5.7  399.7560
## 247       81.40        3 12.2100      12.2100    4.8  256.4100
## 248       17.94        5  4.4850       4.4850    6.8   94.1850
## 249       77.72        4 15.5440      15.5440    8.8  326.4240
## 250       73.06        7 25.5710      25.5710    4.2  536.9910
## 251       46.55        9 20.9475      20.9475    6.4  439.8975
## 252       35.19       10 17.5950      17.5950    8.4  369.4950
```

```
## 253       14.39        2  1.4390       1.4390    7.2   30.2190
## 254       23.75        4  4.7500       4.7500    5.2   99.7500
## 255       58.90        8 23.5600      23.5600    8.9  494.7600
## 256       32.62        4  6.5240       6.5240    9.0  137.0040
## 257       66.35        1  3.3175       3.3175    9.7   69.6675
## 258       25.91        6  7.7730       7.7730    8.7  163.2330
## 259       32.25        4  6.4500       6.4500    6.5  135.4500
## 260       65.94        4 13.1880      13.1880    6.9  276.9480
## 261       75.06        9 33.7770      33.7770    6.2  709.3170
## 262       16.45        4  3.2900       3.2900    5.6   69.0900
## 263       38.30        4  7.6600       7.6600    5.7  160.8600
## 264       22.24       10 11.1200      11.1200    4.2  233.5200
## 265       54.45        1  2.7225       2.7225    7.9   57.1725
## 266       98.40        7 34.4400      34.4400    8.7  723.2400
## 267       35.47        4  7.0940       7.0940    6.9  148.9740
## 268       74.60       10 37.3000      37.3000    9.5  783.3000
## 269       70.74        4 14.1480      14.1480    4.4  297.1080
## 270       35.54       10 17.7700      17.7700    7.0  373.1700
## 271       67.43        5 16.8575      16.8575    6.3  354.0075
## 272       21.12        2  2.1120       2.1120    9.7   44.3520
## 273       21.54        9  9.6930       9.6930    8.8  203.5530
## 274       12.03        2  1.2030       1.2030    5.1   25.2630
## 275       99.71        6 29.9130      29.9130    7.9  628.1730
## 276       47.97        7 16.7895      16.7895    6.2  352.5795
## 277       21.82       10 10.9100      10.9100    7.1  229.1100
## 278       95.42        4 19.0840      19.0840    6.4  400.7640
## 279       70.99       10 35.4950      35.4950    5.7  745.3950
## 280       44.02       10 22.0100      22.0100    9.6  462.2100
## 281       69.96        8 27.9840      27.9840    6.4  587.6640
## 282       37.00        1  1.8500       1.8500    7.9   38.8500
## 283       15.34        1  0.7670       0.7670    6.5   16.1070
## 284       99.83        6 29.9490      29.9490    8.5  628.9290
## 285       47.67        4  9.5340       9.5340    9.1  200.2140
## 286       66.68        5 16.6700      16.6700    7.6  350.0700
## 287       74.86        1  3.7430       3.7430    6.9   78.6030
## 288       23.75        9 10.6875      10.6875    9.5  224.4375
## 289       48.51        7 16.9785      16.9785    5.2  356.5485
## 290       94.88        7 33.2080      33.2080    4.2  697.3680
## 291       40.30       10 20.1500      20.1500    7.0  423.1500
## 292       27.85        7  9.7475       9.7475    6.0  204.6975
## 293       62.48        1  3.1240       3.1240    4.7   65.6040
## 294       36.36        2  3.6360       3.6360    7.1   76.3560
## 295       18.11       10  9.0550       9.0550    5.9  190.1550
## 296       51.92        5 12.9800      12.9800    7.5  272.5800
## 297       28.84        4  5.7680       5.7680    6.4  121.1280
## 298       78.38        6 23.5140      23.5140    5.8  493.7940
## 299       60.01        4 12.0020      12.0020    4.5  252.0420
## 300       88.61        1  4.4305       4.4305    7.7   93.0405
## 301       99.82        2  9.9820       9.9820    6.7  209.6220
## 302       39.01        1  1.9505       1.9505    4.7   40.9605
## 303       48.61        1  2.4305       2.4305    4.4   51.0405
## 304       51.19        4 10.2380      10.2380    4.7  214.9980
## 305       14.96        8  5.9840       5.9840    8.6  125.6640
## 306       72.20        7 25.2700      25.2700    4.3  530.6700
```

```
## 307       40.23        7 14.0805      14.0805    9.6  295.6905
## 308       88.79        8 35.5160      35.5160    4.1  745.8360
## 309       26.48        3  3.9720       3.9720    4.7   83.4120
## 310       81.91        2  8.1910       8.1910    7.8  172.0110
## 311       79.93        6 23.9790      23.9790    5.5  503.5590
## 312       69.33        2  6.9330       6.9330    9.7  145.5930
## 313       14.23        5  3.5575       3.5575    4.4   74.7075
## 314       15.55        9  6.9975       6.9975    5.0  146.9475
## 315       78.13       10 39.0650      39.0650    4.4  820.3650
## 316       99.37        2  9.9370       9.9370    5.2  208.6770
## 317       21.08        3  3.1620       3.1620    7.3   66.4020
## 318       74.79        5 18.6975      18.6975    4.9  392.6475
## 319       29.67        7 10.3845      10.3845    8.1  218.0745
## 320       44.07        4  8.8140       8.8140    8.4  185.0940
## 321       22.93        9 10.3185      10.3185    5.5  216.6885
## 322       39.42        1  1.9710       1.9710    8.4   41.3910
## 323       15.26        6  4.5780       4.5780    9.8   96.1380
## 324       61.77        5 15.4425      15.4425    6.7  324.2925
## 325       21.52        6  6.4560       6.4560    9.4  135.5760
## 326       97.74        4 19.5480      19.5480    6.4  410.5080
## 327       99.78        5 24.9450      24.9450    5.4  523.8450
## 328       94.26        4 18.8520      18.8520    8.6  395.8920
## 329       51.13        4 10.2260      10.2260    4.0  214.7460
## 330       36.36        4  7.2720       7.2720    7.6  152.7120
## 331       22.02        9  9.9090       9.9090    6.8  208.0890
## 332       32.90        3  4.9350       4.9350    9.1  103.6350
## 333       77.02        5 19.2550      19.2550    5.5  404.3550
## 334       23.48        2  2.3480       2.3480    7.9   49.3080
## 335       14.70        5  3.6750       3.6750    8.5   77.1750
## 336       28.45        5  7.1125       7.1125    9.1  149.3625
## 337       76.40        9 34.3800      34.3800    7.5  721.9800
## 338       57.95        6 17.3850      17.3850    5.2  365.0850
## 339       47.65        3  7.1475       7.1475    9.5  150.0975
## 340       42.82        9 19.2690      19.2690    8.9  404.6490
## 341       48.09        3  7.2135       7.2135    7.8  151.4835
## 342       55.97        7 19.5895      19.5895    8.9  411.3795
## 343       76.90        7 26.9150      26.9150    7.7  565.2150
## 344       97.03        5 24.2575      24.2575    9.3  509.4075
## 345       44.65        3  6.6975       6.6975    6.2  140.6475
## 346       77.93        9 35.0685      35.0685    7.6  736.4385
## 347       71.95        1  3.5975       3.5975    7.3   75.5475
## 348       89.25        8 35.7000      35.7000    4.7  749.7000
## 349       26.02        7  9.1070       9.1070    5.1  191.2470
## 350       13.50       10  6.7500       6.7500    4.8  141.7500
## 351       99.30       10 49.6500      49.6500    6.6 1042.6500
## 352       51.69        7 18.0915      18.0915    5.5  379.9215
## 353       54.73        7 19.1555      19.1555    8.5  402.2655
## 354       27.00        9 12.1500      12.1500    4.8  255.1500
## 355       30.24        1  1.5120       1.5120    8.4   31.7520
## 356       89.14        4 17.8280      17.8280    7.8  374.3880
## 357       37.55       10 18.7750      18.7750    9.3  394.2750
## 358       95.44       10 47.7200      47.7200    5.2 1002.1200
## 359       27.50        3  4.1250       4.1250    6.5   86.6250
## 360       74.97        1  3.7485       3.7485    5.6   78.7185
```

```
## 361       80.96        8 32.3840      32.3840    7.4  680.0640
## 362       94.47        8 37.7880      37.7880    9.1  793.5480
## 363       99.79        2  9.9790       9.9790    8.0  209.5590
## 364       73.22        6 21.9660      21.9660    7.2  461.2860
## 365       41.24        4  8.2480       8.2480    7.1  173.2080
## 366       81.68        4 16.3360      16.3360    9.1  343.0560
## 367       51.32        9 23.0940      23.0940    5.6  484.9740
## 368       65.94        4 13.1880      13.1880    6.0  276.9480
## 369       14.36       10  7.1800       7.1800    5.4  150.7800
## 370       21.50        9  9.6750       9.6750    7.8  203.1750
## 371       26.26        7  9.1910       9.1910    9.9  193.0110
## 372       60.96        2  6.0960       6.0960    4.9  128.0160
## 373       70.11        6 21.0330      21.0330    5.2  441.6930
## 374       42.08        6 12.6240      12.6240    8.9  265.1040
## 375       67.09        5 16.7725      16.7725    9.1  352.2225
## 376       96.70        5 24.1750      24.1750    7.0  507.6750
## 377       35.38        9 15.9210      15.9210    9.6  334.3410
## 378       95.49        7 33.4215      33.4215    8.7  701.8515
## 379       96.98        4 19.3960      19.3960    9.4  407.3160
## 380       23.65        4  4.7300       4.7300    4.0   99.3300
## 381       82.33        4 16.4660      16.4660    7.5  345.7860
## 382       26.61        2  2.6610       2.6610    4.2   55.8810
## 383       99.69        5 24.9225      24.9225    9.9  523.3725
## 384       74.89        4 14.9780      14.9780    4.2  314.5380
## 385       40.94        5 10.2350      10.2350    9.9  214.9350
## 386       75.82        1  3.7910       3.7910    5.8   79.6110
## 387       46.77        6 14.0310      14.0310    6.0  294.6510
## 388       32.32       10 16.1600      16.1600   10.0  339.3600
## 389       54.07        9 24.3315      24.3315    9.5  510.9615
## 390       18.22        7  6.3770       6.3770    6.6  133.9170
## 391       80.48        3 12.0720      12.0720    8.1  253.5120
## 392       37.95       10 18.9750      18.9750    9.7  398.4750
## 393       76.82        1  3.8410       3.8410    7.2   80.6610
## 394       52.26       10 26.1300      26.1300    6.2  548.7300
## 395       79.74        1  3.9870       3.9870    7.3   83.7270
## 396       77.50        5 19.3750      19.3750    4.3  406.8750
## 397       54.27        5 13.5675      13.5675    4.6  284.9175
## 398       13.59        9  6.1155       6.1155    5.8  128.4255
## 399       41.06        6 12.3180      12.3180    8.3  258.6780
## 400       19.24        9  8.6580       8.6580    8.0  181.8180
## 401       39.43        6 11.8290      11.8290    9.4  248.4090
## 402       46.22        4  9.2440       9.2440    6.2  194.1240
## 403       13.98        1  0.6990       0.6990    9.8   14.6790
## 404       39.75        5  9.9375       9.9375    9.6  208.6875
## 405       97.79        7 34.2265      34.2265    4.9  718.7565
## 406       67.26        4 13.4520      13.4520    8.0  282.4920
## 407       13.79        5  3.4475       3.4475    7.8   72.3975
## 408       68.71        4 13.7420      13.7420    4.1  288.5820
## 409       56.53        4 11.3060      11.3060    5.5  237.4260
## 410       23.82        5  5.9550       5.9550    5.4  125.0550
## 411       34.21       10 17.1050      17.1050    5.1  359.2050
## 412       21.87        2  2.1870       2.1870    6.9   45.9270
## 413       20.97        5  5.2425       5.2425    7.8  110.0925
## 414       25.84        3  3.8760       3.8760    6.6   81.3960
```

```
## 415       50.93        8 20.3720      20.3720    9.2  427.8120
## 416       96.11        1  4.8055       4.8055    7.8  100.9155
## 417       45.38        4  9.0760       9.0760    8.7  190.5960
## 418       81.51        1  4.0755       4.0755    9.2   85.5855
## 419       57.22        2  5.7220       5.7220    8.3  120.1620
## 420       25.22        7  8.8270       8.8270    8.2  185.3670
## 421       38.60        3  5.7900       5.7900    7.5  121.5900
## 422       84.05        3 12.6075      12.6075    9.8  264.7575
## 423       97.21       10 48.6050      48.6050    8.7 1020.7050
## 424       25.42        8 10.1680      10.1680    6.7  213.5280
## 425       16.28        1  0.8140       0.8140    5.0   17.0940
## 426       40.61        9 18.2745      18.2745    7.0  383.7645
## 427       53.17        7 18.6095      18.6095    8.9  390.7995
## 428       20.87        3  3.1305       3.1305    8.0   65.7405
## 429       67.27        5 16.8175      16.8175    6.9  353.1675
## 430       90.65       10 45.3250      45.3250    7.3  951.8250
## 431       69.08        2  6.9080       6.9080    6.9  145.0680
## 432       43.27        2  4.3270       4.3270    5.7   90.8670
## 433       23.46        6  7.0380       7.0380    6.4  147.7980
## 434       95.54        7 33.4390      33.4390    9.6  702.2190
## 435       47.44        1  2.3720       2.3720    6.8   49.8120
## 436       99.24        9 44.6580      44.6580    9.0  937.8180
## 437       82.93        4 16.5860      16.5860    9.6  348.3060
## 438       33.99        6 10.1970      10.1970    7.7  214.1370
## 439       17.04        4  3.4080       3.4080    7.0   71.5680
## 440       40.86        8 16.3440      16.3440    6.5  343.2240
## 441       17.44        5  4.3600       4.3600    8.1   91.5600
## 442       88.43        8 35.3720      35.3720    4.3  742.8120
## 443       89.21        9 40.1445      40.1445    6.5  843.0345
## 444       12.78        1  0.6390       0.6390    9.5   13.4190
## 445       19.10        7  6.6850       6.6850    9.7  140.3850
## 446       19.15        1  0.9575       0.9575    9.5   20.1075
## 447       27.66       10 13.8300      13.8300    8.9  290.4300
## 448       45.74        3  6.8610       6.8610    6.5  144.0810
## 449       27.07        1  1.3535       1.3535    5.3   28.4235
## 450       39.12        1  1.9560       1.9560    9.6   41.0760
## 451       74.71        6 22.4130      22.4130    6.7  470.6730
## 452       22.01        6  6.6030       6.6030    7.6  138.6630
## 453       63.61        5 15.9025      15.9025    4.8  333.9525
## 454       25.00        1  1.2500       1.2500    5.5   26.2500
## 455       20.77        4  4.1540       4.1540    4.7   87.2340
## 456       29.56        5  7.3900       7.3900    6.9  155.1900
## 457       77.40        9 34.8300      34.8300    4.5  731.4300
## 458       79.39       10 39.6950      39.6950    6.2  833.5950
## 459       46.57       10 23.2850      23.2850    7.6  488.9850
## 460       35.89        1  1.7945       1.7945    7.9   37.6845
## 461       40.52        5 10.1300      10.1300    4.5  212.7300
## 462       73.05       10 36.5250      36.5250    8.7  767.0250
## 463       73.95        4 14.7900      14.7900    6.1  310.5900
## 464       22.62        1  1.1310       1.1310    6.4   23.7510
## 465       51.34        5 12.8350      12.8350    9.1  269.5350
## 466       54.55       10 27.2750      27.2750    7.1  572.7750
## 467       37.15        7 13.0025      13.0025    7.7  273.0525
## 468       37.02        6 11.1060      11.1060    4.5  233.2260
```

```
## 469       21.58        1  1.0790       1.0790    7.2   22.6590
## 470       98.84        1  4.9420       4.9420    8.4  103.7820
## 471       83.77        6 25.1310      25.1310    5.4  527.7510
## 472       40.05        4  8.0100       8.0100    9.7  168.2100
## 473       43.13       10 21.5650      21.5650    5.5  452.8650
## 474       72.57        8 29.0280      29.0280    4.6  609.5880
## 475       64.44        5 16.1100      16.1100    6.6  338.3100
## 476       65.18        3  9.7770       9.7770    6.3  205.3170
## 477       33.26        5  8.3150       8.3150    4.2  174.6150
## 478       84.07        4 16.8140      16.8140    4.4  353.0940
## 479       34.37       10 17.1850      17.1850    6.7  360.8850
## 480       38.60        1  1.9300       1.9300    6.7   40.5300
## 481       65.97        8 26.3880      26.3880    8.4  554.1480
## 482       32.80       10 16.4000      16.4000    6.2  344.4000
## 483       37.14        5  9.2850       9.2850    5.0  194.9850
## 484       60.38       10 30.1900      30.1900    6.0  633.9900
## 485       36.98       10 18.4900      18.4900    7.0  388.2900
## 486       49.49        4  9.8980       9.8980    6.6  207.8580
## 487       41.09       10 20.5450      20.5450    7.3  431.4450
## 488       37.15        4  7.4300       7.4300    8.3  156.0300
## 489       22.96        1  1.1480       1.1480    4.3   24.1080
## 490       77.68        9 34.9560      34.9560    9.8  734.0760
## 491       34.70        2  3.4700       3.4700    8.2   72.8700
## 492       19.66       10  9.8300       9.8300    7.2  206.4300
## 493       25.32        8 10.1280      10.1280    8.7  212.6880
## 494       12.12       10  6.0600       6.0600    8.4  127.2600
## 495       99.89        2  9.9890       9.9890    7.1  209.7690
## 496       75.92        8 30.3680      30.3680    5.5  637.7280
## 497       63.22        2  6.3220       6.3220    8.5  132.7620
## 498       90.24        6 27.0720      27.0720    6.2  568.5120
## 499       98.13        1  4.9065       4.9065    8.9  103.0365
## 500       51.52        8 20.6080      20.6080    9.6  432.7680
## 501       73.97        1  3.6985       3.6985    5.4   77.6685
## 502       31.90        1  1.5950       1.5950    9.1   33.4950
## 503       69.40        2  6.9400       6.9400    9.0  145.7400
## 504       93.31        2  9.3310       9.3310    6.3  195.9510
## 505       88.45        1  4.4225       4.4225    9.5   92.8725
## 506       24.18        8  9.6720       9.6720    9.8  203.1120
## 507       48.50        3  7.2750       7.2750    6.7  152.7750
## 508       84.05        6 25.2150      25.2150    7.7  529.5150
## 509       61.29        5 15.3225      15.3225    7.0  321.7725
## 510       15.95        6  4.7850       4.7850    5.1  100.4850
## 511       90.74        7 31.7590      31.7590    6.2  666.9390
## 512       42.91        5 10.7275      10.7275    6.1  225.2775
## 513       54.28        7 18.9980      18.9980    9.3  398.9580
## 514       99.55        7 34.8425      34.8425    7.6  731.6925
## 515       58.39        7 20.4365      20.4365    8.2  429.1665
## 516       51.47        1  2.5735       2.5735    8.5   54.0435
## 517       54.86        5 13.7150      13.7150    9.8  288.0150
## 518       39.39        5  9.8475       9.8475    8.7  206.7975
## 519       34.73        2  3.4730       3.4730    9.7   72.9330
## 520       71.92        5 17.9800      17.9800    4.3  377.5800
## 521       45.71        3  6.8565       6.8565    7.7  143.9865
## 522       83.17        6 24.9510      24.9510    7.3  523.9710
```

```
## 523       37.44        6 11.2320      11.2320    5.9  235.8720
## 524       62.87        2  6.2870       6.2870    5.0  132.0270
## 525       81.71        6 24.5130      24.5130    8.0  514.7730
## 526       91.41        5 22.8525      22.8525    7.1  479.9025
## 527       39.21        4  7.8420       7.8420    9.0  164.6820
## 528       59.86        2  5.9860       5.9860    6.7  125.7060
## 529       54.36       10 27.1800      27.1800    6.1  570.7800
## 530       98.09        9 44.1405      44.1405    9.3  926.9505
## 531       25.43        6  7.6290       7.6290    7.0  160.2090
## 532       86.68        8 34.6720      34.6720    7.2  728.1120
## 533       22.95       10 11.4750      11.4750    8.2  240.9750
## 534       16.31        9  7.3395       7.3395    8.4  154.1295
## 535       28.32        5  7.0800       7.0800    6.2  148.6800
## 536       16.67        7  5.8345       5.8345    7.4  122.5245
## 537       73.96        1  3.6980       3.6980    5.0   77.6580
## 538       97.94        1  4.8970       4.8970    6.9  102.8370
## 539       73.05        4 14.6100      14.6100    4.9  306.8100
## 540       87.48        6 26.2440      26.2440    5.1  551.1240
## 541       30.68        3  4.6020       4.6020    9.1   96.6420
## 542       75.88        1  3.7940       3.7940    7.1   79.6740
## 543       20.18        4  4.0360       4.0360    5.0   84.7560
## 544       18.77        6  5.6310       5.6310    5.5  118.2510
## 545       71.20        1  3.5600       3.5600    9.2   74.7600
## 546       38.81        4  7.7620       7.7620    4.9  163.0020
## 547       29.42       10 14.7100      14.7100    8.9  308.9100
## 548       60.95        9 27.4275      27.4275    6.0  575.9775
## 549       51.54        5 12.8850      12.8850    4.2  270.5850
## 550       66.06        6 19.8180      19.8180    7.3  416.1780
## 551       57.27        3  8.5905       8.5905    6.5  180.4005
## 552       54.31        9 24.4395      24.4395    8.9  513.2295
## 553       58.24        9 26.2080      26.2080    9.7  550.3680
## 554       22.21        6  6.6630       6.6630    8.6  139.9230
## 555       19.32        7  6.7620       6.7620    6.9  142.0020
## 556       37.48        3  5.6220       5.6220    7.7  118.0620
## 557       72.04        2  7.2040       7.2040    9.5  151.2840
## 558       98.52       10 49.2600      49.2600    4.5 1034.4600
## 559       41.66        6 12.4980      12.4980    5.6  262.4580
## 560       72.42        3 10.8630      10.8630    8.2  228.1230
## 561       21.58        9  9.7110       9.7110    7.3  203.9310
## 562       89.20       10 44.6000      44.6000    4.4  936.6000
## 563       42.42        8 16.9680      16.9680    5.7  356.3280
## 564       74.51        6 22.3530      22.3530    5.0  469.4130
## 565       99.25        2  9.9250       9.9250    9.0  208.4250
## 566       81.21       10 40.6050      40.6050    6.3  852.7050
## 567       49.33       10 24.6650      24.6650    9.4  517.9650
## 568       65.74        9 29.5830      29.5830    7.7  621.2430
## 569       79.86        7 27.9510      27.9510    5.5  586.9710
## 570       73.98        7 25.8930      25.8930    4.1  543.7530
## 571       82.04        5 20.5100      20.5100    7.6  430.7100
## 572       26.67       10 13.3350      13.3350    8.6  280.0350
## 573       10.13        7  3.5455       3.5455    8.3   74.4555
## 574       72.39        2  7.2390       7.2390    8.1  152.0190
## 575       85.91        5 21.4775      21.4775    8.6  451.0275
## 576       81.31        7 28.4585      28.4585    6.3  597.6285
```

```
## 577       60.30        4 12.0600      12.0600    5.8  253.2600
## 578       31.77        4  6.3540       6.3540    6.2  133.4340
## 579       64.27        4 12.8540      12.8540    7.7  269.9340
## 580       69.51        2  6.9510       6.9510    8.1  145.9710
## 581       27.22        3  4.0830       4.0830    7.3   85.7430
## 582       77.68        4 15.5360      15.5360    8.4  326.2560
## 583       92.98        2  9.2980       9.2980    8.0  195.2580
## 584       18.08        4  3.6160       3.6160    9.5   75.9360
## 585       63.06        3  9.4590       9.4590    7.0  198.6390
## 586       51.71        4 10.3420      10.3420    9.8  217.1820
## 587       52.34        3  7.8510       7.8510    9.2  164.8710
## 588       43.06        5 10.7650      10.7650    7.7  226.0650
## 589       59.61       10 29.8050      29.8050    5.3  625.9050
## 590       14.62        5  3.6550       3.6550    4.4   76.7550
## 591       46.53        6 13.9590      13.9590    4.3  293.1390
## 592       24.24        7  8.4840       8.4840    9.4  178.1640
## 593       45.58        1  2.2790       2.2790    9.8   47.8590
## 594       75.20        3 11.2800      11.2800    4.8  236.8800
## 595       96.80        3 14.5200      14.5200    5.3  304.9200
## 596       14.82        3  2.2230       2.2230    8.7   46.6830
## 597       52.20        3  7.8300       7.8300    9.5  164.4300
## 598       46.66        9 20.9970      20.9970    5.3  440.9370
## 599       36.85        5  9.2125       9.2125    9.2  193.4625
## 600       70.32        2  7.0320       7.0320    9.6  147.6720
## 601       83.08        1  4.1540       4.1540    6.4   87.2340
## 602       64.99        1  3.2495       3.2495    4.5   68.2395
## 603       77.56       10 38.7800      38.7800    6.9  814.3800
## 604       54.51        6 16.3530      16.3530    7.8  343.4130
## 605       51.89        7 18.1615      18.1615    4.5  381.3915
## 606       31.75        4  6.3500       6.3500    8.6  133.3500
## 607       53.65        7 18.7775      18.7775    5.2  394.3275
## 608       49.79        4  9.9580       9.9580    6.4  209.1180
## 609       30.61        1  1.5305       1.5305    5.2   32.1405
## 610       57.89        2  5.7890       5.7890    8.9  121.5690
## 611       28.96        1  1.4480       1.4480    6.2   30.4080
## 612       98.97        9 44.5365      44.5365    6.7  935.2665
## 613       93.22        3 13.9830      13.9830    7.2  293.6430
## 614       80.93        1  4.0465       4.0465    9.0   84.9765
## 615       67.45       10 33.7250      33.7250    4.2  708.2250
## 616       38.72        9 17.4240      17.4240    4.2  365.9040
## 617       72.60        6 21.7800      21.7800    6.9  457.3800
## 618       87.91        5 21.9775      21.9775    4.4  461.5275
## 619       98.53        6 29.5590      29.5590    4.0  620.7390
## 620       43.46        6 13.0380      13.0380    8.5  273.7980
## 621       71.68        3 10.7520      10.7520    9.2  225.7920
## 622       91.61        1  4.5805       4.5805    9.8   96.1905
## 623       94.59        7 33.1065      33.1065    4.9  695.2365
## 624       83.25       10 41.6250      41.6250    4.4  874.1250
## 625       91.35        1  4.5675       4.5675    6.8   95.9175
## 626       78.88        2  7.8880       7.8880    9.1  165.6480
## 627       60.87        2  6.0870       6.0870    8.7  127.8270
## 628       82.58       10 41.2900      41.2900    5.0  867.0900
## 629       53.30        3  7.9950       7.9950    7.5  167.8950
## 630       12.09        1  0.6045       0.6045    8.2   12.6945
```

```
## 631       64.19       10 32.0950      32.0950    6.7  673.9950
## 632       78.31        3 11.7465      11.7465    5.4  246.6765
## 633       83.77        2  8.3770       8.3770    7.0  175.9170
## 634       99.70        3 14.9550      14.9550    4.7  314.0550
## 635       79.91        3 11.9865      11.9865    5.0  251.7165
## 636       66.47       10 33.2350      33.2350    5.0  697.9350
## 637       28.95        7 10.1325      10.1325    6.0  212.7825
## 638       46.20        1  2.3100       2.3100    6.3   48.5100
## 639       17.63        5  4.4075       4.4075    8.5   92.5575
## 640       52.42        3  7.8630       7.8630    7.5  165.1230
## 641       98.79        3 14.8185      14.8185    6.4  311.1885
## 642       88.55        8 35.4200      35.4200    4.7  743.8200
## 643       55.67        2  5.5670       5.5670    6.0  116.9070
## 644       72.52        8 29.0080      29.0080    4.0  609.1680
## 645       12.05        5  3.0125       3.0125    5.5   63.2625
## 646       19.36        9  8.7120       8.7120    8.7  182.9520
## 647       70.21        6 21.0630      21.0630    7.4  442.3230
## 648       33.63        1  1.6815       1.6815    5.6   35.3115
## 649       15.49        2  1.5490       1.5490    6.3   32.5290
## 650       24.74       10 12.3700      12.3700    7.1  259.7700
## 651       75.66        5 18.9150      18.9150    7.8  397.2150
## 652       55.81        6 16.7430      16.7430    9.9  351.6030
## 653       72.78       10 36.3900      36.3900    7.3  764.1900
## 654       37.32        9 16.7940      16.7940    5.1  352.6740
## 655       60.18        4 12.0360      12.0360    9.4  252.7560
## 656       15.69        3  2.3535       2.3535    5.8   49.4235
## 657       99.69        1  4.9845       4.9845    8.0  104.6745
## 658       88.15        3 13.2225      13.2225    7.9  277.6725
## 659       27.93        5  6.9825       6.9825    5.9  146.6325
## 660       55.45        1  2.7725       2.7725    4.9   58.2225
## 661       42.97        3  6.4455       6.4455    9.3  135.3555
## 662       17.14        7  5.9990       5.9990    7.9  125.9790
## 663       58.75        6 17.6250      17.6250    5.9  370.1250
## 664       87.10       10 43.5500      43.5500    9.9  914.5500
## 665       98.80        2  9.8800       9.8800    7.7  207.4800
## 666       48.63        4  9.7260       9.7260    7.6  204.2460
## 667       57.74        3  8.6610       8.6610    7.7  181.8810
## 668       17.97        4  3.5940       3.5940    6.4   75.4740
## 669       47.71        6 14.3130      14.3130    4.4  300.5730
## 670       40.62        2  4.0620       4.0620    4.1   85.3020
## 671       56.04       10 28.0200      28.0200    4.4  588.4200
## 672       93.40        2  9.3400       9.3400    5.5  196.1400
## 673       73.41        3 11.0115      11.0115    4.0  231.2415
## 674       33.64        8 13.4560      13.4560    9.3  282.5760
## 675       45.48       10 22.7400      22.7400    4.8  477.5400
## 676       83.77        2  8.3770       8.3770    4.6  175.9170
## 677       64.08        7 22.4280      22.4280    7.3  470.9880
## 678       73.47        4 14.6940      14.6940    6.0  308.5740
## 679       58.95       10 29.4750      29.4750    8.1  618.9750
## 680       48.50        6 14.5500      14.5500    9.4  305.5500
## 681       39.48        1  1.9740       1.9740    6.5   41.4540
## 682       34.81        1  1.7405       1.7405    7.0   36.5505
## 683       49.32        6 14.7960      14.7960    7.1  310.7160
## 684       21.48        2  2.1480       2.1480    6.6   45.1080
```

```
## 685       23.08        6  6.9240       6.9240    4.9  145.4040
## 686       49.10        2  4.9100       4.9100    6.4  103.1100
## 687       64.83        2  6.4830       6.4830    8.0  136.1430
## 688       63.56       10 31.7800      31.7800    4.3  667.3800
## 689       72.88        2  7.2880       7.2880    6.1  153.0480
## 690       67.10        3 10.0650      10.0650    7.5  211.3650
## 691       70.19        9 31.5855      31.5855    6.7  663.2955
## 692       55.04        7 19.2640      19.2640    5.2  404.5440
## 693       48.63       10 24.3150      24.3150    8.8  510.6150
## 694       73.38        7 25.6830      25.6830    9.5  539.3430
## 695       52.60        9 23.6700      23.6700    7.6  497.0700
## 696       87.37        5 21.8425      21.8425    6.6  458.6925
## 697       27.04        4  5.4080       5.4080    6.9  113.5680
## 698       62.19        4 12.4380      12.4380    4.3  261.1980
## 699       69.58        9 31.3110      31.3110    7.8  657.5310
## 700       97.50       10 48.7500      48.7500    8.0 1023.7500
## 701       60.41        8 24.1640      24.1640    9.6  507.4440
## 702       32.32        3  4.8480       4.8480    4.3  101.8080
## 703       19.77       10  9.8850       9.8850    5.0  207.5850
## 704       80.47        9 36.2115      36.2115    9.2  760.4415
## 705       88.39        9 39.7755      39.7755    6.3  835.2855
## 706       71.77        7 25.1195      25.1195    8.9  527.5095
## 707       43.00        4  8.6000       8.6000    7.6  180.6000
## 708       68.98        1  3.4490       3.4490    4.8   72.4290
## 709       15.62        8  6.2480       6.2480    9.1  131.2080
## 710       25.70        3  3.8550       3.8550    6.1   80.9550
## 711       80.62        6 24.1860      24.1860    9.1  507.9060
## 712       75.53        4 15.1060      15.1060    8.3  317.2260
## 713       77.63        9 34.9335      34.9335    7.2  733.6035
## 714       13.85        9  6.2325       6.2325    6.0  130.8825
## 715       98.70        8 39.4800      39.4800    8.5  829.0800
## 716       35.68        5  8.9200       8.9200    6.6  187.3200
## 717       71.46        7 25.0110      25.0110    4.5  525.2310
## 718       11.94        3  1.7910       1.7910    8.1   37.6110
## 719       45.38        3  6.8070       6.8070    7.2  142.9470
## 720       17.48        6  5.2440       5.2440    6.1  110.1240
## 721       25.56        7  8.9460       8.9460    7.1  187.8660
## 722       90.63        9 40.7835      40.7835    5.1  856.4535
## 723       44.12        3  6.6180       6.6180    7.9  138.9780
## 724       36.77        7 12.8695      12.8695    7.4  270.2595
## 725       23.34        4  4.6680       4.6680    7.4   98.0280
## 726       28.50        8 11.4000      11.4000    6.6  239.4000
## 727       55.57        3  8.3355       8.3355    5.9  175.0455
## 728       69.74       10 34.8700      34.8700    8.9  732.2700
## 729       97.26        4 19.4520      19.4520    6.8  408.4920
## 730       52.18        7 18.2630      18.2630    9.3  383.5230
## 731       22.32        4  4.4640       4.4640    4.4   93.7440
## 732       56.00        3  8.4000       8.4000    4.8  176.4000
## 733       19.70        1  0.9850       0.9850    9.5   20.6850
## 734       75.88        7 26.5580      26.5580    8.9  557.7180
## 735       53.72        1  2.6860       2.6860    6.4   56.4060
## 736       81.95       10 40.9750      40.9750    6.0  860.4750
## 737       81.20        7 28.4200      28.4200    8.1  596.8200
## 738       58.76       10 29.3800      29.3800    9.0  616.9800
```

```
## 739       91.56        8 36.6240      36.6240    6.0  769.1040
## 740       93.96        9 42.2820      42.2820    9.8  887.9220
## 741       55.61        7 19.4635      19.4635    8.5  408.7335
## 742       84.83        1  4.2415       4.2415    8.8   89.0715
## 743       71.63        2  7.1630       7.1630    8.8  150.4230
## 744       37.69        2  3.7690       3.7690    9.5   79.1490
## 745       31.67        8 12.6680      12.6680    5.6  266.0280
## 746       38.42        1  1.9210       1.9210    8.6   40.3410
## 747       65.23       10 32.6150      32.6150    5.2  684.9150
## 748       10.53        5  2.6325       2.6325    5.8   55.2825
## 749       12.29        9  5.5305       5.5305    8.0  116.1405
## 750       81.23        7 28.4305      28.4305    9.0  597.0405
## 751       22.32        4  4.4640       4.4640    4.1   93.7440
## 752       27.28        5  6.8200       6.8200    8.6  143.2200
## 753       17.42       10  8.7100       8.7100    7.0  182.9100
## 754       73.28        5 18.3200      18.3200    8.4  384.7200
## 755       84.87        3 12.7305      12.7305    7.4  267.3405
## 756       97.29        8 38.9160      38.9160    6.2  817.2360
## 757       35.74        8 14.2960      14.2960    4.9  300.2160
## 758       96.52        6 28.9560      28.9560    4.5  608.0760
## 759       18.85       10  9.4250       9.4250    5.6  197.9250
## 760       55.39        4 11.0780      11.0780    8.0  232.6380
## 761       77.20       10 38.6000      38.6000    5.6  810.6000
## 762       72.13       10 36.0650      36.0650    4.2  757.3650
## 763       63.88        8 25.5520      25.5520    9.9  536.5920
## 764       10.69        5  2.6725       2.6725    7.6   56.1225
## 765       55.50        4 11.1000      11.1000    6.6  233.1000
## 766       95.46        8 38.1840      38.1840    4.7  801.8640
## 767       76.06        3 11.4090      11.4090    9.8  239.5890
## 768       13.69        6  4.1070       4.1070    6.3   86.2470
## 769       95.64        4 19.1280      19.1280    7.9  401.6880
## 770       11.43        6  3.4290       3.4290    7.7   72.0090
## 771       95.54        4 19.1080      19.1080    4.5  401.2680
## 772       85.87        7 30.0545      30.0545    8.0  631.1445
## 773       67.99        7 23.7965      23.7965    5.7  499.7265
## 774       52.42        1  2.6210       2.6210    6.3   55.0410
## 775       65.65        2  6.5650       6.5650    6.0  137.8650
## 776       28.86        5  7.2150       7.2150    8.0  151.5150
## 777       65.31        7 22.8585      22.8585    4.2  480.0285
## 778       93.38        1  4.6690       4.6690    9.6   98.0490
## 779       25.25        5  6.3125       6.3125    6.1  132.5625
## 780       87.87        9 39.5415      39.5415    5.6  830.3715
## 781       21.80        8  8.7200       8.7200    8.3  183.1200
## 782       94.76        4 18.9520      18.9520    7.8  397.9920
## 783       30.62        1  1.5310       1.5310    4.1   32.1510
## 784       44.01        8 17.6040      17.6040    8.8  369.6840
## 785       10.16        5  2.5400       2.5400    4.1   53.3400
## 786       74.58        7 26.1030      26.1030    9.0  548.1630
## 787       71.89        8 28.7560      28.7560    5.5  603.8760
## 788       10.99        5  2.7475       2.7475    9.3   57.6975
## 789       60.47        3  9.0705       9.0705    5.6  190.4805
## 790       58.91        7 20.6185      20.6185    9.7  432.9885
## 791       46.41        1  2.3205       2.3205    4.0   48.7305
## 792       68.55        4 13.7100      13.7100    9.2  287.9100
```

```
## 793       97.37       10 48.6850      48.6850    4.9 1022.3850
## 794       92.60        7 32.4100      32.4100    9.3  680.6100
## 795       46.61        2  4.6610       4.6610    6.6   97.8810
## 796       27.18        2  2.7180       2.7180    4.3   57.0780
## 797       60.87        1  3.0435       3.0435    5.5   63.9135
## 798       24.49       10 12.2450      12.2450    8.1  257.1450
## 799       92.78        1  4.6390       4.6390    9.8   97.4190
## 800       86.69        5 21.6725      21.6725    9.4  455.1225
## 801       23.01        6  6.9030       6.9030    7.9  144.9630
## 802       30.20        8 12.0800      12.0800    5.1  253.6800
## 803       67.39        7 23.5865      23.5865    6.9  495.3165
## 804       48.96        9 22.0320      22.0320    8.0  462.6720
## 805       75.59        9 34.0155      34.0155    8.0  714.3255
## 806       77.47        4 15.4940      15.4940    4.2  325.3740
## 807       93.18        2  9.3180       9.3180    8.5  195.6780
## 808       50.23        4 10.0460      10.0460    9.0  210.9660
## 809       17.75        1  0.8875       0.8875    8.6   18.6375
## 810       62.18       10 31.0900      31.0900    6.0  652.8900
## 811       10.75        8  4.3000       4.3000    6.2   90.3000
## 812       40.26       10 20.1300      20.1300    5.0  422.7300
## 813       64.97        5 16.2425      16.2425    6.5  341.0925
## 814       95.15        1  4.7575       4.7575    6.0   99.9075
## 815       48.62        8 19.4480      19.4480    5.0  408.4080
## 816       53.21        8 21.2840      21.2840    5.0  446.9640
## 817       45.44        7 15.9040      15.9040    9.2  333.9840
## 818       33.88        8 13.5520      13.5520    9.6  284.5920
## 819       96.16        4 19.2320      19.2320    8.4  403.8720
## 820       47.16        5 11.7900      11.7900    6.0  247.5900
## 821       52.89        4 10.5780      10.5780    6.7  222.1380
## 822       47.68        2  4.7680       4.7680    4.1  100.1280
## 823       10.17        1  0.5085       0.5085    5.9   10.6785
## 824       68.71        3 10.3065      10.3065    8.7  216.4365
## 825       60.08        7 21.0280      21.0280    4.5  441.5880
## 826       22.01        4  4.4020       4.4020    6.6   92.4420
## 827       72.11        9 32.4495      32.4495    7.7  681.4395
## 828       41.28        3  6.1920       6.1920    8.5  130.0320
## 829       64.95       10 32.4750      32.4750    5.2  681.9750
## 830       74.22       10 37.1100      37.1100    4.3  779.3100
## 831       10.56        8  4.2240       4.2240    7.6   88.7040
## 832       62.57        4 12.5140      12.5140    9.5  262.7940
## 833       11.85        8  4.7400       4.7400    4.1   99.5400
## 834       91.30        1  4.5650       4.5650    9.2   95.8650
## 835       40.73        7 14.2555      14.2555    5.4  299.3655
## 836       52.38        1  2.6190       2.6190    5.8   54.9990
## 837       38.54        5  9.6350       9.6350    5.6  202.3350
## 838       44.63        6 13.3890      13.3890    5.1  281.1690
## 839       55.87       10 27.9350      27.9350    5.8  586.6350
## 840       29.22        6  8.7660       8.7660    5.0  184.0860
## 841       51.94        3  7.7910       7.7910    7.9  163.6110
## 842       60.30        1  3.0150       3.0150    6.0   63.3150
## 843       39.47        2  3.9470       3.9470    5.0   82.8870
## 844       14.87        2  1.4870       1.4870    8.9   31.2270
## 845       21.32        1  1.0660       1.0660    5.9   22.3860
## 846       93.78        3 14.0670      14.0670    5.9  295.4070
```

```
## 847       73.26        1  3.6630       3.6630    9.7   76.9230
## 848       22.38        1  1.1190       1.1190    8.6   23.4990
## 849       72.88        9 32.7960      32.7960    4.0  688.7160
## 850       99.10        6 29.7300      29.7300    4.2  624.3300
## 851       74.10        1  3.7050       3.7050    9.2   77.8050
## 852       98.48        2  9.8480       9.8480    9.2  206.8080
## 853       53.19        7 18.6165      18.6165    5.0  390.9465
## 854       52.79       10 26.3950      26.3950   10.0  554.2950
## 855       95.95        5 23.9875      23.9875    8.8  503.7375
## 856       36.51        9 16.4295      16.4295    4.2  345.0195
## 857       21.12        8  8.4480       8.4480    6.3  177.4080
## 858       28.31        4  5.6620       5.6620    8.2  118.9020
## 859       57.59        6 17.2770      17.2770    5.1  362.8170
## 860       47.63        9 21.4335      21.4335    5.0  450.1035
## 861       86.27        1  4.3135       4.3135    7.0   90.5835
## 862       12.76        2  1.2760       1.2760    7.8   26.7960
## 863       11.28        9  5.0760       5.0760    4.3  106.5960
## 864       51.07        7 17.8745      17.8745    7.0  375.3645
## 865       79.59        3 11.9385      11.9385    6.6  250.7085
## 866       33.81        3  5.0715       5.0715    7.3  106.5015
## 867       90.53        8 36.2120      36.2120    6.5  760.4520
## 868       62.82        2  6.2820       6.2820    4.9  131.9220
## 869       24.31        3  3.6465       3.6465    4.3   76.5765
## 870       64.59        4 12.9180      12.9180    9.3  271.2780
## 871       24.82        7  8.6870       8.6870    7.1  182.4270
## 872       56.50        1  2.8250       2.8250    9.6   59.3250
## 873       21.43       10 10.7150      10.7150    6.2  225.0150
## 874       89.06        6 26.7180      26.7180    9.9  561.0780
## 875       23.29        4  4.6580       4.6580    5.9   97.8180
## 876       65.26        8 26.1040      26.1040    6.3  548.1840
## 877       52.35        1  2.6175       2.6175    4.0   54.9675
## 878       39.75        1  1.9875       1.9875    6.1   41.7375
## 879       90.02        8 36.0080      36.0080    4.5  756.1680
## 880       12.10        8  4.8400       4.8400    8.6  101.6400
## 881       33.21       10 16.6050      16.6050    6.0  348.7050
## 882       10.18        8  4.0720       4.0720    9.5   85.5120
## 883       31.99       10 15.9950      15.9950    9.9  335.8950
## 884       34.42        6 10.3260      10.3260    7.5  216.8460
## 885       83.34        2  8.3340       8.3340    7.6  175.0140
## 886       45.58        7 15.9530      15.9530    5.0  335.0130
## 887       87.90        1  4.3950       4.3950    6.7   92.2950
## 888       73.47       10 36.7350      36.7350    9.5  771.4350
## 889       12.19        8  4.8760       4.8760    6.8  102.3960
## 890       76.92       10 38.4600      38.4600    5.6  807.6600
## 891       83.66        5 20.9150      20.9150    7.2  439.2150
## 892       57.91        8 23.1640      23.1640    8.1  486.4440
## 893       92.49        5 23.1225      23.1225    8.6  485.5725
## 894       28.38        5  7.0950       7.0950    9.4  148.9950
## 895       50.45        6 15.1350      15.1350    8.9  317.8350
## 896       99.16        8 39.6640      39.6640    4.2  832.9440
## 897       60.74        7 21.2590      21.2590    5.0  446.4390
## 898       47.27        6 14.1810      14.1810    8.8  297.8010
## 899       85.60        7 29.9600      29.9600    5.3  629.1600
## 900       35.04        9 15.7680      15.7680    4.6  331.1280
```

```
## 901       44.84        9 20.1780      20.1780    7.5  423.7380
## 902       45.97        4  9.1940       9.1940    5.1  193.0740
## 903       27.73        5  6.9325       6.9325    4.2  145.5825
## 904       11.53        7  4.0355       4.0355    8.1   84.7455
## 905       58.32        2  5.8320       5.8320    6.0  122.4720
## 906       78.38        4 15.6760      15.6760    7.9  329.1960
## 907       84.61       10 42.3050      42.3050    8.8  888.4050
## 908       82.88        5 20.7200      20.7200    6.6  435.1200
## 909       79.54        2  7.9540       7.9540    6.2  167.0340
## 910       49.01       10 24.5050      24.5050    4.2  514.6050
## 911       29.15        3  4.3725       4.3725    7.3   91.8225
## 912       56.13        4 11.2260      11.2260    8.6  235.7460
## 913       93.12        8 37.2480      37.2480    6.8  782.2080
## 914       51.34        8 20.5360      20.5360    7.6  431.2560
## 915       99.60        3 14.9400      14.9400    5.8  313.7400
## 916       35.49        6 10.6470      10.6470    4.1  223.5870
## 917       42.85        1  2.1425       2.1425    9.3   44.9925
## 918       94.67        4 18.9340      18.9340    6.8  397.6140
## 919       68.97        3 10.3455      10.3455    8.7  217.2555
## 920       26.26        3  3.9390       3.9390    6.3   82.7190
## 921       35.79        9 16.1055      16.1055    5.1  338.2155
## 922       16.37        6  4.9110       4.9110    7.0  103.1310
## 923       12.73        2  1.2730       1.2730    5.2   26.7330
## 924       83.14        7 29.0990      29.0990    6.6  611.0790
## 925       35.22        6 10.5660      10.5660    6.5  221.8860
## 926       13.78        4  2.7560       2.7560    9.0   57.8760
## 927       88.31        1  4.4155       4.4155    5.2   92.7255
## 928       39.62        9 17.8290      17.8290    6.8  374.4090
## 929       88.25        9 39.7125      39.7125    7.6  833.9625
## 930       25.31        2  2.5310       2.5310    7.2   53.1510
## 931       99.92        6 29.9760      29.9760    7.1  629.4960
## 932       83.35        2  8.3350       8.3350    9.5  175.0350
## 933       74.44       10 37.2200      37.2200    5.1  781.6200
## 934       64.08        7 22.4280      22.4280    7.6  470.9880
## 935       63.15        6 18.9450      18.9450    9.8  397.8450
## 936       85.72        3 12.8580      12.8580    5.1  270.0180
## 937       78.89        7 27.6115      27.6115    7.5  579.8415
## 938       89.48        5 22.3700      22.3700    7.4  469.7700
## 939       92.09        3 13.8135      13.8135    4.2  290.0835
## 940       57.29        6 17.1870      17.1870    5.9  360.9270
## 941       66.52        4 13.3040      13.3040    6.9  279.3840
## 942       99.82        9 44.9190      44.9190    6.6  943.2990
## 943       45.68       10 22.8400      22.8400    5.7  479.6400
## 944       50.79        5 12.6975      12.6975    5.3  266.6475
## 945       10.08        7  3.5280       3.5280    4.2   74.0880
## 946       93.88        7 32.8580      32.8580    7.3  690.0180
## 947       84.25        2  8.4250       8.4250    5.3  176.9250
## 948       53.78        1  2.6890       2.6890    4.7   56.4690
## 949       35.81        5  8.9525       8.9525    7.9  188.0025
## 950       26.43        8 10.5720      10.5720    8.9  222.0120
## 951       39.91        3  5.9865       5.9865    9.3  125.7165
## 952       21.90        3  3.2850       3.2850    4.7   68.9850
## 953       62.85        4 12.5700      12.5700    8.7  263.9700
## 954       21.04        4  4.2080       4.2080    7.6   88.3680
```

```
## 955       65.91        6 19.7730      19.7730    5.7  415.2330
## 956       42.57        7 14.8995      14.8995    6.8  312.8895
## 957       50.49        9 22.7205      22.7205    5.4  477.1305
## 958       46.02        6 13.8060      13.8060    7.1  289.9260
## 959       15.80       10  7.9000       7.9000    7.8  165.9000
## 960       98.66        9 44.3970      44.3970    8.4  932.3370
## 961       91.98        1  4.5990       4.5990    9.8   96.5790
## 962       20.89        2  2.0890       2.0890    9.8   43.8690
## 963       15.50        1  0.7750       0.7750    7.4   16.2750
## 964       96.82        3 14.5230      14.5230    6.7  304.9830
## 965       33.33        2  3.3330       3.3330    6.4   69.9930
## 966       38.27        2  3.8270       3.8270    5.8   80.3670
## 967       33.30        9 14.9850      14.9850    7.2  314.6850
## 968       81.01        3 12.1515      12.1515    9.3  255.1815
## 969       15.80        3  2.3700       2.3700    9.5   49.7700
## 970       34.49        5  8.6225       8.6225    9.0  181.0725
## 971       84.63       10 42.3150      42.3150    9.0  888.6150
## 972       36.91        7 12.9185      12.9185    6.7  271.2885
## 973       87.08        7 30.4780      30.4780    5.5  640.0380
## 974       80.08        3 12.0120      12.0120    5.4  252.2520
## 975       86.13        2  8.6130       8.6130    8.2  180.8730
## 976       49.92        2  4.9920       4.9920    7.0  104.8320
## 977       74.66        4 14.9320      14.9320    8.5  313.5720
## 978       26.60        6  7.9800       7.9800    4.9  167.5800
## 979       25.45        1  1.2725       1.2725    5.1   26.7225
## 980       67.77        1  3.3885       3.3885    6.5   71.1585
## 981       59.59        4 11.9180      11.9180    9.8  250.2780
## 982       58.15        4 11.6300      11.6300    8.4  244.2300
## 983       97.48        9 43.8660      43.8660    7.4  921.1860
## 984       99.96        7 34.9860      34.9860    6.1  734.7060
## 985       96.37        7 33.7295      33.7295    6.0  708.3195
## 986       63.71        5 15.9275      15.9275    8.5  334.4775
## 987       14.76        2  1.4760       1.4760    4.3   30.9960
## 988       62.00        8 24.8000      24.8000    6.2  520.8000
## 989       82.34       10 41.1700      41.1700    4.3  864.5700
## 990       75.37        8 30.1480      30.1480    8.4  633.1080
## 991       56.56        5 14.1400      14.1400    4.5  296.9400
## 992       76.60       10 38.3000      38.3000    6.0  804.3000
## 993       58.03        2  5.8030       5.8030    8.8  121.8630
## 994       17.49       10  8.7450       8.7450    6.6  183.6450
## 995       60.95        1  3.0475       3.0475    5.9   63.9975
## 996       40.35        1  2.0175       2.0175    6.2   42.3675
## 997       97.38       10 48.6900      48.6900    4.4 1022.4900
## 998       31.84        1  1.5920       1.5920    7.7   33.4320
## 999       65.82        1  3.2910       3.2910    4.1   69.1110
## 1000      88.34        7 30.9190      30.9190    6.6  649.2990
```

```
# Load data
sales = read.csv('http://bit.ly/CarreFourDataset')
head(sales)
```

```
##    Invoice.ID Branch Customer.type Gender           Product.line Unit.price
## 1 750-67-8428      A        Member Female      Health and beauty      74.69
## 2 226-31-3081      C        Normal Female Electronic accessories      15.28
```

```
## 3 631-41-3108      A        Normal   Male     Home and lifestyle      46.33
## 4 123-19-1176      A        Member   Male      Health and beauty      58.22
## 5 373-73-7910      A        Normal   Male      Sports and travel      86.31
## 6 699-14-3026      C        Normal   Male Electronic accessories      85.39
##   Quantity     Tax      Date  Time     Payment   cogs gross.margin.percentage
## 1        7 26.1415  1/5/2019 13:08     Ewallet 522.83               4.761905
## 2        5  3.8200  3/8/2019 10:29        Cash  76.40               4.761905
## 3        7 16.2155  3/3/2019 13:23 Credit card 324.31               4.761905
## 4        8 23.2880 1/27/2019 20:33     Ewallet 465.76               4.761905
## 5        7 30.2085  2/8/2019 10:37     Ewallet 604.17               4.761905
## 6        7 29.8865 3/25/2019 18:30     Ewallet 597.73               4.761905
##   gross.income Rating    Total
## 1      26.1415    9.1 548.9715
## 2       3.8200    9.6  80.2200
## 3      16.2155    7.4 340.5255
## 4      23.2880    8.4 489.0480
## 5      30.2085    5.3 634.3785
## 6      29.8865    4.1 627.6165
```

The Tax and gross.income columns have the same values

```
# Confirm the above claim
all(sales$Tax == sales$gross.income)
```

```
## [1] TRUE
```

```
# Removing the income column
sales <- sales[-c(14)]
```

```
str(sales)
```

```
## 'data.frame':    1000 obs. of  15 variables:
##  $ Invoice.ID            : Factor w/ 1000 levels "101-17-6199",..: 815 143 654 19 340 734 316 265 7
##  $ Branch                : Factor w/ 3 levels "A","B","C": 1 3 1 1 1 3 1 3 1 2 ...
##  $ Customer.type         : Factor w/ 2 levels "Member","Normal": 1 2 2 1 2 2 1 2 1 1 ...
##  $ Gender                : Factor w/ 2 levels "Female","Male": 1 1 2 2 2 2 1 1 1 1 ...
##  $ Product.line          : Factor w/ 6 levels "Electronic accessories",..: 4 1 5 4 6 1 1 5 4 3 ...
##  $ Unit.price            : num  74.7 15.3 46.3 58.2 86.3 ...
##  $ Quantity              : int  7 5 7 8 7 7 6 10 2 3 ...
##  $ Tax                   : num  26.14 3.82 16.22 23.29 30.21 ...
##  $ Date                  : Factor w/ 89 levels "1/1/2019","1/10/2019",..: 27 88 82 20 58 77 49 48 2
##  $ Time                  : Factor w/ 506 levels "10:00","10:01",..: 147 24 156 486 30 394 215 78 34
##  $ Payment               : Factor w/ 3 levels "Cash","Credit card",..: 3 1 2 3 3 3 3 3 2 2 ...
##  $ cogs                  : num  522.8 76.4 324.3 465.8 604.2 ...
##  $ gross.margin.percentage: num  4.76 4.76 4.76 4.76 4.76 ...
##  $ Rating                : num  9.1 9.6 7.4 8.4 5.3 4.1 5.8 8 7.2 5.9 ...
##  $ Total                 : num  549 80.2 340.5 489 634.4 ...
```

```
head(sales)
```

```
##    Invoice.ID Branch Customer.type Gender           Product.line Unit.price
## 1 750-67-8428      A        Member Female      Health and beauty      74.69
```

```
## 2 226-31-3081      C        Normal Female Electronic accessories      15.28
## 3 631-41-3108      A        Normal   Male     Home and lifestyle      46.33
## 4 123-19-1176      A        Member   Male      Health and beauty      58.22
## 5 373-73-7910      A        Normal   Male      Sports and travel      86.31
## 6 699-14-3026      C        Normal   Male Electronic accessories      85.39
##   Quantity     Tax      Date  Time     Payment   cogs gross.margin.percentage
## 1        7 26.1415  1/5/2019 13:08     Ewallet 522.83               4.761905
## 2        5  3.8200  3/8/2019 10:29        Cash  76.40               4.761905
## 3        7 16.2155  3/3/2019 13:23 Credit card 324.31               4.761905
## 4        8 23.2880 1/27/2019 20:33     Ewallet 465.76               4.761905
## 5        7 30.2085  2/8/2019 10:37     Ewallet 604.17               4.761905
## 6        7 29.8865 3/25/2019 18:30     Ewallet 597.73               4.761905
##   Rating    Total
## 1    9.1 548.9715
## 2    9.6  80.2200
## 3    7.4 340.5255
## 4    8.4 489.0480
## 5    5.3 634.3785
## 6    4.1 627.6165
```

```
summary(sales[, -c(1,9)])
```

```
##  Branch  Customer.type    Gender                     Product.line
##  A:340   Member:501    Female:501   Electronic accessories:170
##  B:332   Normal:499    Male  :499   Fashion accessories   :178
##  C:328                              Food and beverages    :174
##                                     Health and beauty     :152
##                                     Home and lifestyle    :160
##                                     Sports and travel     :166
##
##    Unit.price       Quantity          Tax               Time
##  Min.   :10.08   Min.   : 1.00   Min.   : 0.5085   14:42  :  7
##  1st Qu.:32.88   1st Qu.: 3.00   1st Qu.: 5.9249   19:48  :  7
##  Median :55.23   Median : 5.00   Median :12.0880   17:38  :  6
##  Mean   :55.67   Mean   : 5.51   Mean   :15.3794   10:11  :  5
##  3rd Qu.:77.94   3rd Qu.: 8.00   3rd Qu.:22.4453   11:40  :  5
##  Max.   :99.96   Max.   :10.00   Max.   :49.6500   11:51  :  5
##                                                    (Other):965
##         Payment         cogs        gross.margin.percentage     Rating
##  Cash       :344   Min.   : 10.17   Min.   :4.762           Min.   : 4.000
##  Credit card:311   1st Qu.:118.50   1st Qu.:4.762           1st Qu.: 5.500
##  Ewallet    :345   Median :241.76   Median :4.762           Median : 7.000
##                    Mean   :307.59   Mean   :4.762           Mean   : 6.973
##                    3rd Qu.:448.90   3rd Qu.:4.762           3rd Qu.: 8.500
##                    Max.   :993.00   Max.   :4.762           Max.   :10.000
##
##      Total
##  Min.   :  10.68
##  1st Qu.: 124.42
##  Median : 253.85
##  Mean   : 322.97
##  3rd Qu.: 471.35
##  Max.   :1042.65
##
```

```
# Reordering columns
sales <- sales[, c(2,3,4,5,11,6,7,8,12,13)]
row.names(sales) <- sales$Invoice.ID
# Perform PCA on qualitative variables
names(sales)
```

```
##  [1] "Branch"                  "Customer.type"
##  [3] "Gender"                  "Product.line"
##  [5] "Payment"                 "Unit.price"
##  [7] "Quantity"                "Tax"
##  [9] "cogs"                    "gross.margin.percentage"
```

```
df1 <- select(sales,-c(gross.margin.percentage))
```

```
names(df1)
```

```
## [1] "Branch"        "Customer.type" "Gender"        "Product.line"
## [5] "Payment"       "Unit.price"    "Quantity"      "Tax"
## [9] "cogs"
```

```
library(dplyr)
df1 <- select_if(df1, is.numeric)
```

```
names(df1)
```

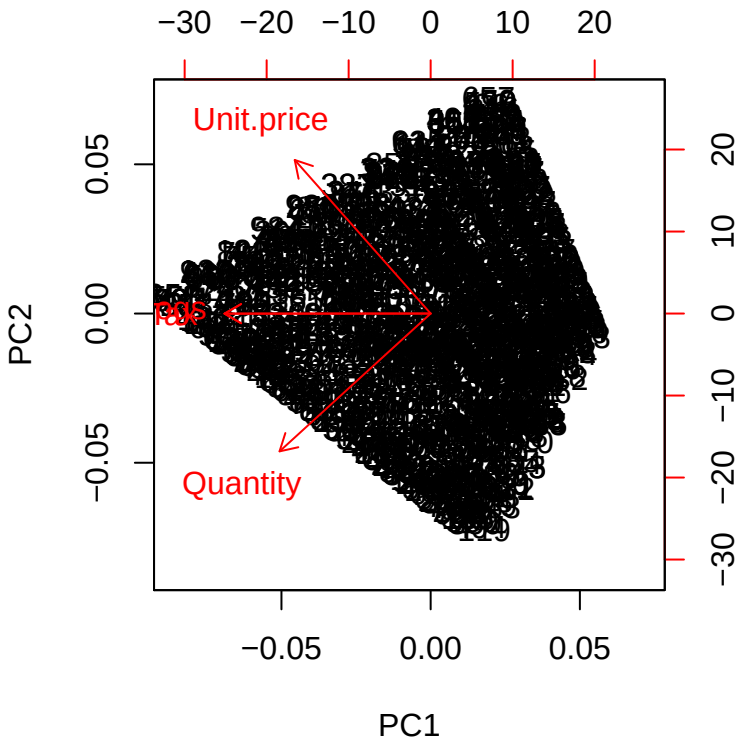
I'll then convert the column names to numeric

```
## [1] "Unit.price" "Quantity"   "Tax"        "cogs"
```

```
pca <- prcomp(df1, scale=TRUE)
summary(pca)
```

```
## Importance of components:
##                           PC1    PC2     PC3      PC4
## Standard deviation     1.7132 0.9946 0.27510 3.17e-16
## Proportion of Variance 0.7338 0.2473 0.01892 0.00e+00
## Cumulative Proportion  0.7338 0.9811 1.00000 1.00e+00
```

```
biplot(pca)
```


−30
−20
−10
0
10
20
Unit.price
Quantity
0.05
0.00
−0.05
PC2
20
10
0
−10
−20
−30
−0.05
0.00
0.05
PC1