Assignment 1

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Task 1 Manipulation

Question 1 Load the dataset EurostatCrime2017.csv. Notice that the first column of the csv contains the names of the countries that must be read as row names

```
Eurocrimedata=read.csv("C:\\Users\\Vivek\\Downloads\\EurostatCrime2017.csv", header = TRUE, r
ow.names = 1)
Eurocrimedata
```

```
##                       Intentional_homicide Attempted_intentional_homicide
## Belgium                               1.70                           8.47
## Bulgaria                              1.34                           0.44
## Czechia                               0.62                           0.72
## Denmark                               1.06                           3.69
## Germany                               0.89                           2.18
## Estonia                               2.20                           1.22
## Ireland                               0.86                           0.27
## Greece                                0.72                           1.39
## Spain                                 0.66                           1.76
## France                                1.41                           3.77
## Croatia                               1.11                           3.01
## Italy                                 0.61                           1.81
## Cyprus                                0.82                           1.17
## Latvia                                5.59                           0.92
## Lithuania                             3.97                           0.56
## Luxembourg                            0.34                          12.53
## Hungary                               1.60                             NA
## Malta                                 1.96                           1.30
## Netherlands                          17.09                             NA
## Austria                                NA                             NA
## Poland                                0.73                           0.58
## Portugal                              0.74                             NA
## Romania                               1.46                           1.95
## Slovenia                              0.92                           1.98
## Slovakia                              1.47                           1.47
## Finland                               1.25                           6.32
## Sweden                                1.13                           9.09
## England_and_Wales                     1.24                             NA
## Scotland                              1.09                           4.52
## Northern_Ireland_UK                   1.29                           5.30
## Iceland                               0.89                           2.36
## Liechtenstein                          NA                             NA
## Norway                                0.53                           0.93
## Switzerland                           0.53                           2.27
## Montenegro                            1.77                           8.19
## North_Macedonia                       1.21                           2.70
## Albania                               1.81                           4.48
## Serbia                                1.12                           1.58
## Turkey                                 NA                             NA
## Bosnia_and_Herzegovina                 NA                             NA
## Kosovo                                1.85                           7.51
##                       Assault Kidnapping Sexual.violence Robbery Burglary
## Belgium                611.03      10.31           63.22  166.97       NA
## Bulgaria                39.58       1.44            9.19   21.94   124.57
## Czechia                 45.06       0.16           13.37   14.98   228.07
## Denmark                 33.12         NA           83.41   35.52   955.37
## Germany                166.09       5.60           42.19   47.08   442.53
## Estonia                  5.78       0.00           19.69   15.28       NA
## Ireland                 84.59       1.59           53.11   45.71   399.24
## Greece                  14.02       0.72            4.21   39.66   606.86
## Spain                   38.88       0.15           25.13  143.53   376.79
## France                     NA         NA           62.50  149.81       NA
## Croatia                 19.21       0.00           11.46   20.80   289.18
## Italy                  108.56       0.33            8.44   51.44       NA
## Cyprus                  16.85       4.21            3.86   13.69   169.40
## Latvia                  33.69       0.21           13.44   30.97   300.08
```

```
## Lithuania                6.25       0.00            7.94   38.20       NA
## Luxembourg              99.04       7.79           61.29   76.86       NA
## Hungary                   NA       0.03            6.00    8.58       NA
## Malta                   40.41       0.00           16.95   43.88   342.60
## Netherlands             28.04       2.28           28.19   46.75   435.71
## Austria                   NA         NA              NA      NA       NA
## Poland                  19.23         NA            8.48   21.37   178.32
## Portugal                 5.66       2.83           24.62  115.28   221.86
## Romania                  1.38       1.58            7.81   16.10   138.35
## Slovenia                67.67       0.05           20.67   11.52   423.64
## Slovakia                30.21       1.67           12.97    8.63   105.24
## Finland                 28.73       0.02           55.49   29.80   401.63
## Sweden                  46.87         NA          188.83   86.53   845.61
## England_and_Wales      875.35       7.76          229.31  131.63   747.03
## Scotland                72.84       4.30          214.75   28.74   279.42
## Northern_Ireland_UK     56.41       3.59          179.95   30.38   365.52
## Iceland                 30.44         NA          140.68   14.48   313.29
## Liechtenstein             NA         NA              NA      NA       NA
## Norway                  40.16         NA          107.16   14.85       NA
## Switzerland              6.96       0.04           30.82   20.74   491.13
## Montenegro              23.62       0.00            3.70   18.96   145.09
## North_Macedonia          7.14       0.34            4.92   20.11       NA
## Albania                  4.35       0.07            3.93    6.40       NA
## Serbia                  18.24       0.17            4.45   25.98   239.01
## Turkey                    NA         NA              NA      NA       NA
## Bosnia_and_Herzegovina    NA         NA              NA      NA       NA
## Kosovo                  18.56       0.90            5.10   17.21   320.60
##                      Burglary_of_private_residential_premises   Theft
## Belgium                                                    NA      NA
## Bulgaria                                                   NA  451.99
## Czechia                                                 68.37  631.51
## Denmark                                                702.60 3721.21
## Germany                                                141.22 1401.36
## Estonia                                                 73.35  580.18
## Ireland                                                    NA 1454.59
## Greece                                                 204.70 1019.05
## Spain                                                  225.88  349.09
## France                                                     NA      NA
## Croatia                                                109.14  298.81
## Italy                                                  323.20 1765.74
## Cyprus                                                 107.98  110.43
## Latvia                                                  73.28  745.29
## Lithuania                                               90.94  598.33
## Luxembourg                                                 NA      NA
## Hungary                                                    NA  819.95
## Malta                                                  185.32 1793.41
## Netherlands                                            291.51 1517.78
## Austria                                                    NA      NA
## Poland                                                  55.62  281.58
## Portugal                                               119.31  759.36
## Romania                                                 73.70  489.47
## Slovenia                                               140.62  994.19
## Slovakia                                                30.26  287.21
## Finland                                                 86.69 2003.22
## Sweden                                                 387.51 3524.83
## England_and_Wales                                      425.63 2685.07
## Scotland                                               201.17 1598.29
## Northern_Ireland_UK                                        NA 1254.61
```

```
## Iceland                                                113.20 1129.60
## Liechtenstein                                             NA      NA
## Norway                                                    NA 1791.05
## Switzerland                                            286.01 1647.57
## Montenegro                                                NA   80.82
## North_Macedonia                                           NA      NA
## Albania                                                39.80  176.98
## Serbia                                                 63.82  295.00
## Turkey                                                    NA      NA
## Bosnia_and_Herzegovina                                    NA      NA
## Kosovo                                                    NA  336.69
##                         Theft_of_a_motorized_land_vehicle
## Belgium                                                NA
## Bulgaria                                            33.36
## Czechia                                            201.84
## Denmark                                              3.79
## Germany                                             65.58
## Estonia                                             25.77
## Ireland                                            102.46
## Greece                                             315.99
## Spain                                               70.70
## France                                                 NA
## Croatia                                             20.56
## Italy                                              240.57
## Cyprus                                             112.31
## Latvia                                              55.48
## Lithuania                                           35.08
## Luxembourg                                             NA
## Hungary                                                NA
## Malta                                               72.13
## Netherlands                                        148.99
## Austria                                                NA
## Poland                                              32.78
## Portugal                                            99.46
## Romania                                             14.90
## Slovenia                                            26.09
## Slovakia                                            28.04
## Finland                                            110.84
## Sweden                                             247.52
## England_and_Wales                                  191.25
## Scotland                                            92.78
## Northern_Ireland_UK                                 75.59
## Iceland                                            137.73
## Liechtenstein                                          NA
## Norway                                              77.15
## Switzerland                                         78.77
## Montenegro                                           4.98
## North_Macedonia                                        NA
## Albania                                             11.44
## Serbia                                              22.31
## Turkey                                                 NA
## Bosnia_and_Herzegovina                                 NA
## Kosovo                                              13.12
##                         Unlawful_acts_involving_controlled_drugs_or_precursors
## Belgium                                                                506.65
## Bulgaria                                                                70.25
## Czechia                                                                 52.93
## Denmark                                                                481.56
```

```
## Germany                                 400.60
## Estonia                                 441.46
## Ireland                                 351.58
## Greece                                  118.82
## Spain                                    27.85
## France                                  344.77
## Croatia                                     NA
## Italy                                    63.28
## Cyprus                                  111.02
## Latvia                                  153.27
## Lithuania                                92.07
## Luxembourg                              454.23
## Hungary                                  65.96
## Malta                                    67.35
## Netherlands                              70.11
## Austria                                     NA
## Poland                                  170.26
## Portugal                                 62.86
## Romania                                  25.24
## Slovenia                                 78.61
## Slovakia                                 27.23
## Finland                                 505.61
## Sweden                                 1027.08
## England_and_Wales                        44.43
## Scotland                                596.43
## Northern_Ireland_UK                     336.11
## Iceland                                 641.05
## Liechtenstein                               NA
## Norway                                  638.70
## Switzerland                             951.05
## Montenegro                               37.12
## North_Macedonia                             NA
## Albania                                  72.55
## Serbia                                  119.41
## Turkey                                      NA
## Bosnia_and_Herzegovina                      NA
## Kosovo                                   74.46
```

Question 2

The size (number of rows and columns) and the structure of this dataset.

```
str(Eurocrimedata)
```

```
## 'data.frame':    41 obs. of  11 variables:
##  $ Intentional_homicide                                 : num  1.7 1.34 0.62 1.06 0.89 2.
2 0.86 0.72 0.66 1.41 ...
##  $ Attempted_intentional_homicide                       : num  8.47 0.44 0.72 3.69 2.18
1.22 0.27 1.39 1.76 3.77 ...
##  $ Assault                                              : num  611 39.6 45.1 33.1 166.1
...
##  $ Kidnapping                                           : num  10.31 1.44 0.16 NA 5.6 ...
##  $ Sexual.violence                                      : num  63.22 9.19 13.37 83.41 42.
19 ...
##  $ Robbery                                              : num  167 21.9 15 35.5 47.1 ...
##  $ Burglary                                             : num  NA 125 228 955 443 ...
##  $ Burglary_of_private_residential_premises             : num  NA NA 68.4 702.6 141.2 ...
##  $ Theft                                                : num  NA 452 632 3721 1401 ...
##  $ Theft_of_a_motorized_land_vehicle                    : num  NA 33.36 201.84 3.79 65.58
...
##  $ Unlawful_acts_involving_controlled_drugs_or_precursors: num  506.6 70.2 52.9 481.6 400.
6 ...
```

```
nrow(Eurocrimedata)
```

```
## [1] 41
```

```
ncol(Eurocrimedata)
```

```
## [1] 11
```

Question 3

Please consider NA values as 0 in this case. Add a new column called All Theft Remove the columns: Theft, Theft of a motorized land vehicle, Burglary, and Burglary of private residential premises.

```
Eurocrimedata$Theft[is.na(Eurocrimedata$Theft)] <-0
Eurocrimedata$Burglary[is.na(Eurocrimedata$Burglary)]<- 0
Eurocrimedata$Burglary_of_private_residential_premises[(is.na(Eurocrimedata$Burglary_of_priva
te_residential_premises))]<-0
Eurocrimedata$Theft_of_a_motorized_land_vehicle[is.na(Eurocrimedata$Theft_of_a_motorized_land
_vehicle)]<-0
```

```
Eurocrimedata$All_Theft<-(Eurocrimedata$Theft+Eurocrimedata$Theft_of_a_motorized_land_vehicle
+Eurocrimedata$Burglary+Eurocrimedata$Burglary_of_private_residential_premises)
Eurocrimedata$All_Theft
```

```
##  [1]    0.00  609.92 1129.79 5382.97 2050.69  679.30 1956.29 2146.60
##  [9] 1022.46    0.00  717.69 2329.51  500.12 1174.13  724.35    0.00
## [17]  819.95 2393.46 2393.99    0.00  548.30 1199.99  716.42 1584.54
## [25]  450.75 2602.38 5005.47 4048.98 2171.66 1695.72 1693.82    0.00
## [33] 1868.20 2503.48  230.89    0.00  228.22  620.14    0.00    0.00
## [41]  670.41
```

```
str(Eurocrimedata)
```

```
## 'data.frame':    41 obs. of  12 variables:
##  $ Intentional_homicide                                 : num  1.7 1.34 0.62 1.06 0.89 2.
2 0.86 0.72 0.66 1.41 ...
##  $ Attempted_intentional_homicide                       : num  8.47 0.44 0.72 3.69 2.18
1.22 0.27 1.39 1.76 3.77 ...
##  $ Assault                                              : num  611 39.6 45.1 33.1 166.1
...
##  $ Kidnapping                                           : num  10.31 1.44 0.16 NA 5.6 ...
##  $ Sexual.violence                                      : num  63.22 9.19 13.37 83.41 42.
19 ...
##  $ Robbery                                              : num  167 21.9 15 35.5 47.1 ...
##  $ Burglary                                             : num  0 125 228 955 443 ...
##  $ Burglary_of_private_residential_premises             : num  0 0 68.4 702.6 141.2 ...
##  $ Theft                                                : num  0 452 632 3721 1401 ...
##  $ Theft_of_a_motorized_land_vehicle                    : num  0 33.36 201.84 3.79 65.58
...
##  $ Unlawful_acts_involving_controlled_drugs_or_precursors: num  506.6 70.2 52.9 481.6 400.
6 ...
##  $ All_Theft                                            : num  0 610 1130 5383 2051 ...
```

```
NewEurocrimedata<-data.frame(Eurocrimedata)
NewEurocrimedata <-subset(Eurocrimedata, select = -c(7,8,9,10))
NewEurocrimedata
```

```
##                         Intentional_homicide Attempted_intentional_homicide
## Belgium                                 1.70                           8.47
## Bulgaria                                1.34                           0.44
## Czechia                                 0.62                           0.72
## Denmark                                 1.06                           3.69
## Germany                                 0.89                           2.18
## Estonia                                 2.20                           1.22
## Ireland                                 0.86                           0.27
## Greece                                  0.72                           1.39
## Spain                                   0.66                           1.76
## France                                  1.41                           3.77
## Croatia                                 1.11                           3.01
## Italy                                   0.61                           1.81
## Cyprus                                  0.82                           1.17
## Latvia                                  5.59                           0.92
## Lithuania                               3.97                           0.56
## Luxembourg                              0.34                          12.53
## Hungary                                 1.60                             NA
## Malta                                   1.96                           1.30
## Netherlands                            17.09                             NA
## Austria                                  NA                             NA
## Poland                                  0.73                           0.58
## Portugal                                0.74                             NA
## Romania                                 1.46                           1.95
## Slovenia                                0.92                           1.98
## Slovakia                                1.47                           1.47
## Finland                                 1.25                           6.32
## Sweden                                  1.13                           9.09
## England_and_Wales                       1.24                             NA
## Scotland                                1.09                           4.52
## Northern_Ireland_UK                     1.29                           5.30
## Iceland                                 0.89                           2.36
## Liechtenstein                            NA                             NA
## Norway                                  0.53                           0.93
## Switzerland                             0.53                           2.27
## Montenegro                              1.77                           8.19
## North_Macedonia                         1.21                           2.70
## Albania                                 1.81                           4.48
## Serbia                                  1.12                           1.58
## Turkey                                   NA                             NA
## Bosnia_and_Herzegovina                   NA                             NA
## Kosovo                                  1.85                           7.51
##                         Assault Kidnapping Sexual.violence Robbery
## Belgium                  611.03      10.31           63.22  166.97
## Bulgaria                  39.58       1.44            9.19   21.94
## Czechia                   45.06       0.16           13.37   14.98
## Denmark                   33.12         NA           83.41   35.52
## Germany                  166.09       5.60           42.19   47.08
## Estonia                    5.78       0.00           19.69   15.28
## Ireland                   84.59       1.59           53.11   45.71
## Greece                    14.02       0.72            4.21   39.66
## Spain                     38.88       0.15           25.13  143.53
## France                       NA         NA           62.50  149.81
## Croatia                   19.21       0.00           11.46   20.80
## Italy                    108.56       0.33            8.44   51.44
## Cyprus                    16.85       4.21            3.86   13.69
## Latvia                    33.69       0.21           13.44   30.97
```

```
## Lithuania                 6.25       0.00            7.94   38.20
## Luxembourg               99.04       7.79           61.29   76.86
## Hungary                     NA       0.03            6.00    8.58
## Malta                    40.41       0.00           16.95   43.88
## Netherlands              28.04       2.28           28.19   46.75
## Austria                     NA         NA              NA      NA
## Poland                   19.23         NA            8.48   21.37
## Portugal                  5.66       2.83           24.62  115.28
## Romania                   1.38       1.58            7.81   16.10
## Slovenia                 67.67       0.05           20.67   11.52
## Slovakia                 30.21       1.67           12.97    8.63
## Finland                  28.73       0.02           55.49   29.80
## Sweden                   46.87         NA          188.83   86.53
## England_and_Wales       875.35       7.76          229.31  131.63
## Scotland                 72.84       4.30          214.75   28.74
## Northern_Ireland_UK      56.41       3.59          179.95   30.38
## Iceland                  30.44         NA          140.68   14.48
## Liechtenstein               NA         NA              NA      NA
## Norway                   40.16         NA          107.16   14.85
## Switzerland               6.96       0.04           30.82   20.74
## Montenegro               23.62       0.00            3.70   18.96
## North_Macedonia           7.14       0.34            4.92   20.11
## Albania                   4.35       0.07            3.93    6.40
## Serbia                   18.24       0.17            4.45   25.98
## Turkey                      NA         NA              NA      NA
## Bosnia_and_Herzegovina      NA         NA              NA      NA
## Kosovo                   18.56       0.90            5.10   17.21
##                       Unlawful_acts_involving_controlled_drugs_or_precursors
## Belgium                                                               506.65
## Bulgaria                                                               70.25
## Czechia                                                                52.93
## Denmark                                                               481.56
## Germany                                                               400.60
## Estonia                                                               441.46
## Ireland                                                               351.58
## Greece                                                                118.82
## Spain                                                                  27.85
## France                                                                344.77
## Croatia                                                                   NA
## Italy                                                                  63.28
## Cyprus                                                                111.02
## Latvia                                                                153.27
## Lithuania                                                              92.07
## Luxembourg                                                            454.23
## Hungary                                                                65.96
## Malta                                                                  67.35
## Netherlands                                                            70.11
## Austria                                                                   NA
## Poland                                                                170.26
## Portugal                                                               62.86
## Romania                                                                25.24
## Slovenia                                                               78.61
## Slovakia                                                               27.23
## Finland                                                               505.61
## Sweden                                                               1027.08
## England_and_Wales                                                      44.43
## Scotland                                                              596.43
## Northern_Ireland_UK                                                   336.11
```

```
## Iceland                                                    641.05
## Liechtenstein                                                 NA
## Norway                                                     638.70
## Switzerland                                                951.05
## Montenegro                                                  37.12
## North_Macedonia                                               NA
## Albania                                                     72.55
## Serbia                                                     119.41
## Turkey                                                        NA
## Bosnia_and_Herzegovina                                        NA
## Kosovo                                                      74.46
##                         All_Theft
## Belgium                      0.00
## Bulgaria                   609.92
## Czechia                   1129.79
## Denmark                   5382.97
## Germany                   2050.69
## Estonia                    679.30
## Ireland                   1956.29
## Greece                    2146.60
## Spain                     1022.46
## France                       0.00
## Croatia                    717.69
## Italy                     2329.51
## Cyprus                     500.12
## Latvia                    1174.13
## Lithuania                  724.35
## Luxembourg                   0.00
## Hungary                    819.95
## Malta                     2393.46
## Netherlands               2393.99
## Austria                      0.00
## Poland                     548.30
## Portugal                  1199.99
## Romania                    716.42
## Slovenia                  1584.54
## Slovakia                   450.75
## Finland                   2602.38
## Sweden                    5005.47
## England_and_Wales         4048.98
## Scotland                  2171.66
## Northern_Ireland_UK       1695.72
## Iceland                   1693.82
## Liechtenstein                0.00
## Norway                    1868.20
## Switzerland               2503.48
## Montenegro                 230.89
## North_Macedonia              0.00
## Albania                    228.22
## Serbia                     620.14
## Turkey                       0.00
## Bosnia_and_Herzegovina       0.00
## Kosovo                     670.41
```

Question 5 and 6

Remove the countries with missing data from the data frame. Adding new data frame containing complete cases.

```
newdf<-NewEurocrimedata[!complete.cases(NewEurocrimedata),]
Countries<-row.names(newdf)
Countries
```

```
##  [1] "Denmark"               "France"
##  [3] "Croatia"               "Hungary"
##  [5] "Netherlands"           "Austria"
##  [7] "Poland"                "Portugal"
##  [9] "Sweden"                "England_and_Wales"
## [11] "Iceland"               "Liechtenstein"
## [13] "Norway"                "North_Macedonia"
## [15] "Turkey"                "Bosnia_and_Herzegovina"
```

```
a<-NewEurocrimedata[complete.cases(NewEurocrimedata),]
str(a)
```

```
## 'data.frame':    25 obs. of  8 variables:
##  $ Intentional_homicide                                 : num  1.7 1.34 0.62 0.89 2.2 0.8
6 0.72 0.66 0.61 0.82 ...
##  $ Attempted_intentional_homicide                       : num  8.47 0.44 0.72 2.18 1.22
0.27 1.39 1.76 1.81 1.17 ...
##  $ Assault                                              : num  611.03 39.58 45.06 166.09
5.78 ...
##  $ Kidnapping                                           : num  10.31 1.44 0.16 5.6 0 ...
##  $ Sexual.violence                                      : num  63.22 9.19 13.37 42.19 19.
69 ...
##  $ Robbery                                              : num  167 21.9 15 47.1 15.3 ...
##  $ Unlawful_acts_involving_controlled_drugs_or_precursors: num  506.6 70.2 52.9 400.6 441.
5 ...
##  $ All_Theft                                            : num  0 610 1130 2051 679 ...
```

Task 2: Analysis

The 3 most common crimes in Ireland in 2017 and the country which the highest overall record of offences

```
Top<- sort(a['Ireland',],decreasing = TRUE)
Top[1]
```

```
##         All_Theft
## Ireland   1956.29
```

```
Top[2]
```

```
##         Unlawful_acts_involving_controlled_drugs_or_precursors
## Ireland                                              351.58
```

```
Top[3]
```

```
##         Assault
## Ireland   84.59
```

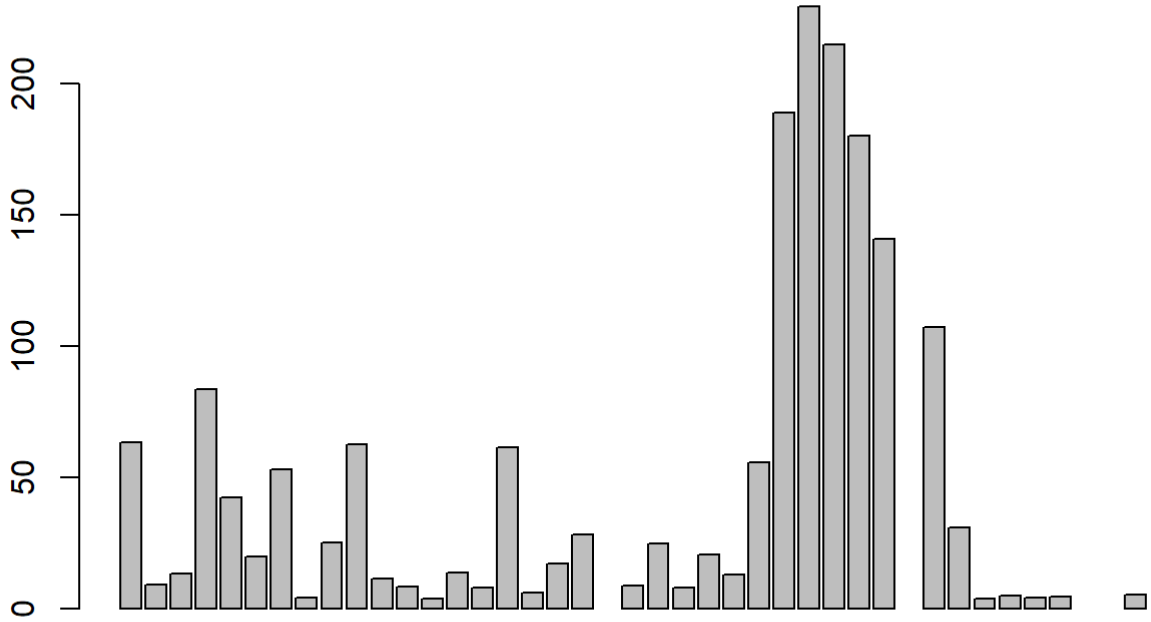
```
Highestoffense<-sort(apply(a,MARGIN=1,FUN= sum),decreasing = TRUE)
Highestoffense[1]
```

```
## Switzerland
##     3515.89
```

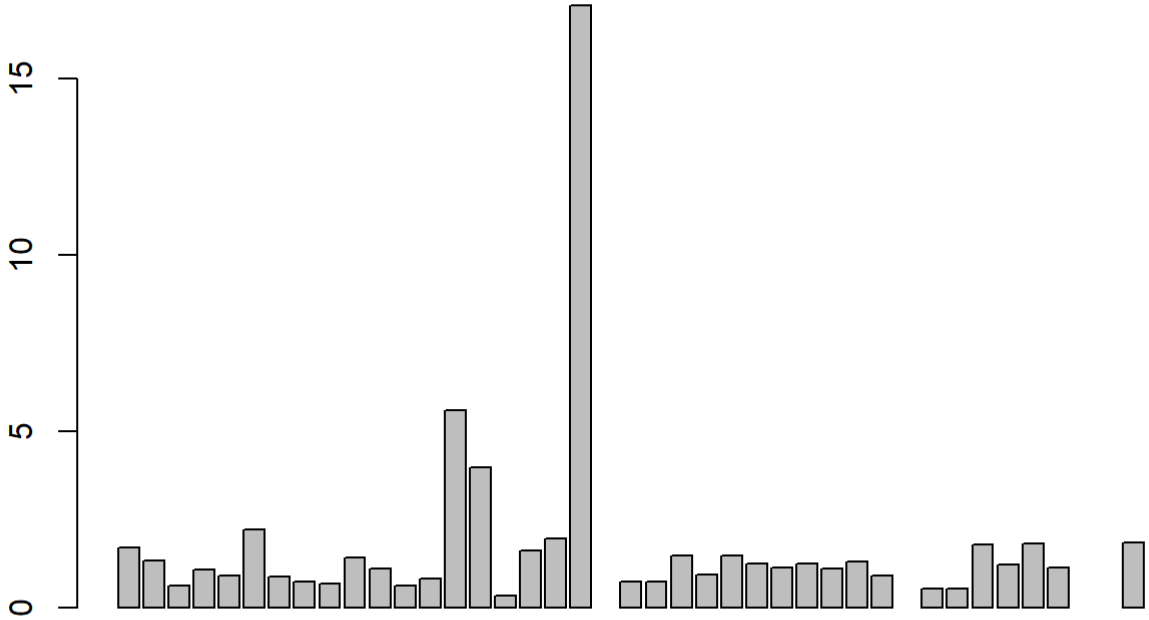
Task3 Creativity.

All the crimes individually are plotted in form of barplot,boxplot and pair. In case of bar plot x- axis are the countries. In case of boxplot we can see that most of the graphs are negatively skewed.

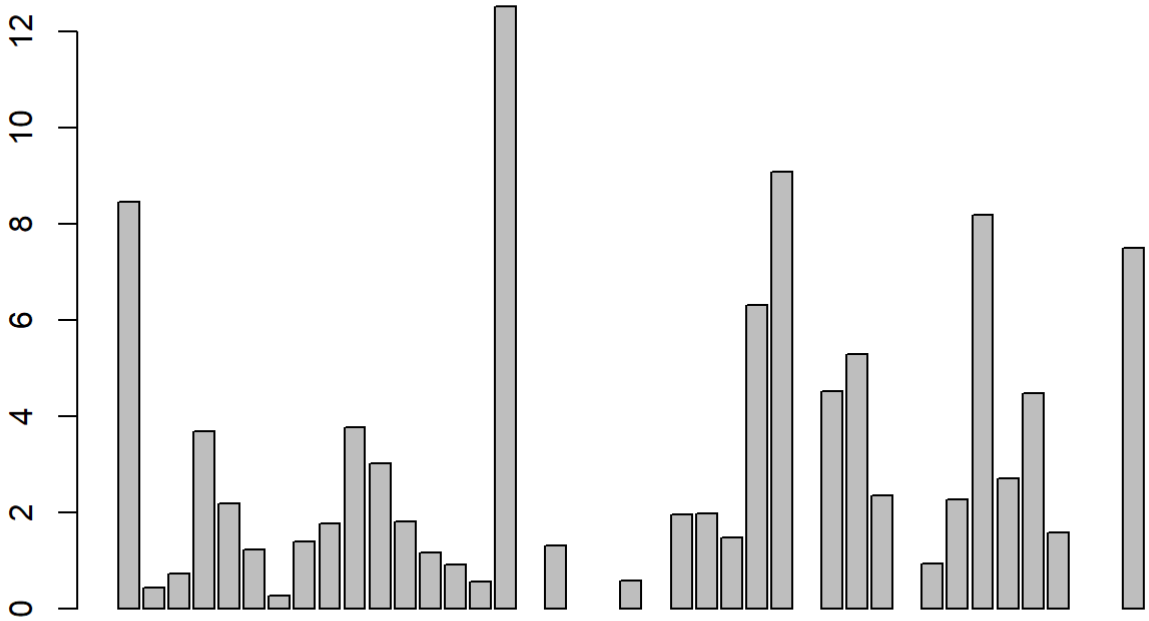
```
barplot(NewEurocrimedata$Sexual.violence)
```



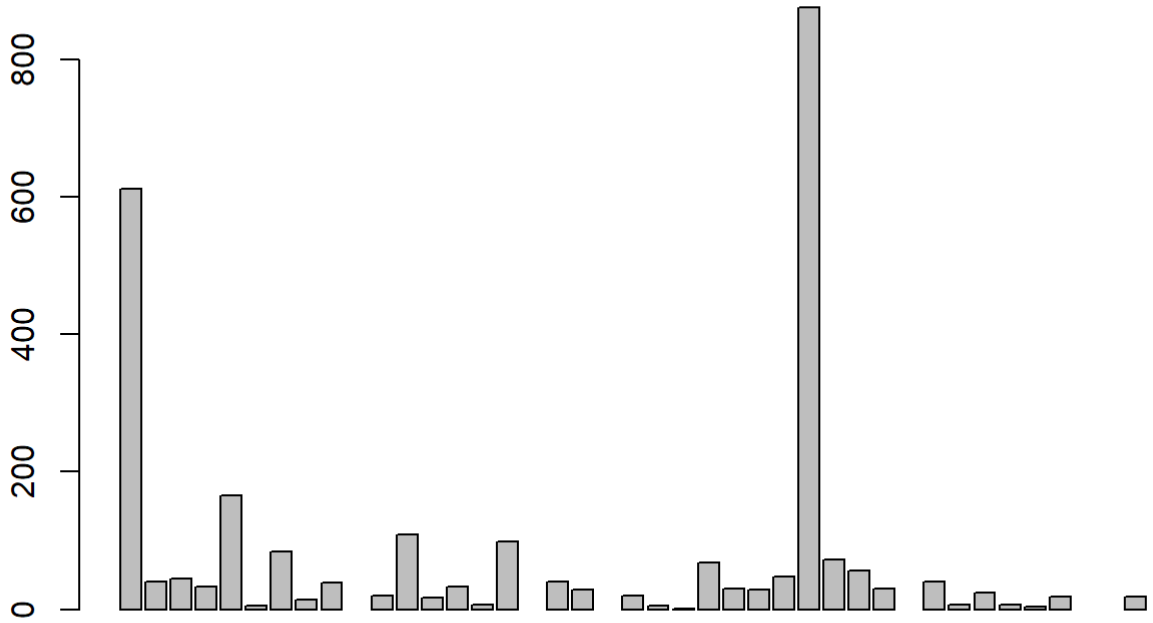

```
barplot(NewEurocrimedata$Intentional_homicide)
```



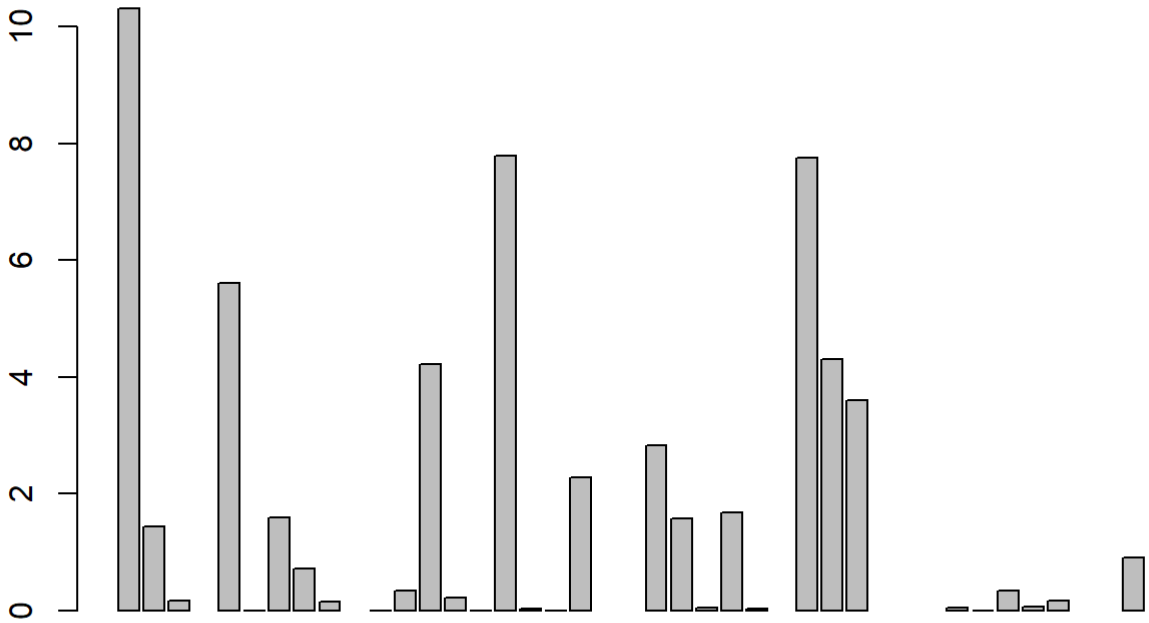

```
barplot(NewEurocrimedata$Attempted_intentional_homicide)
```



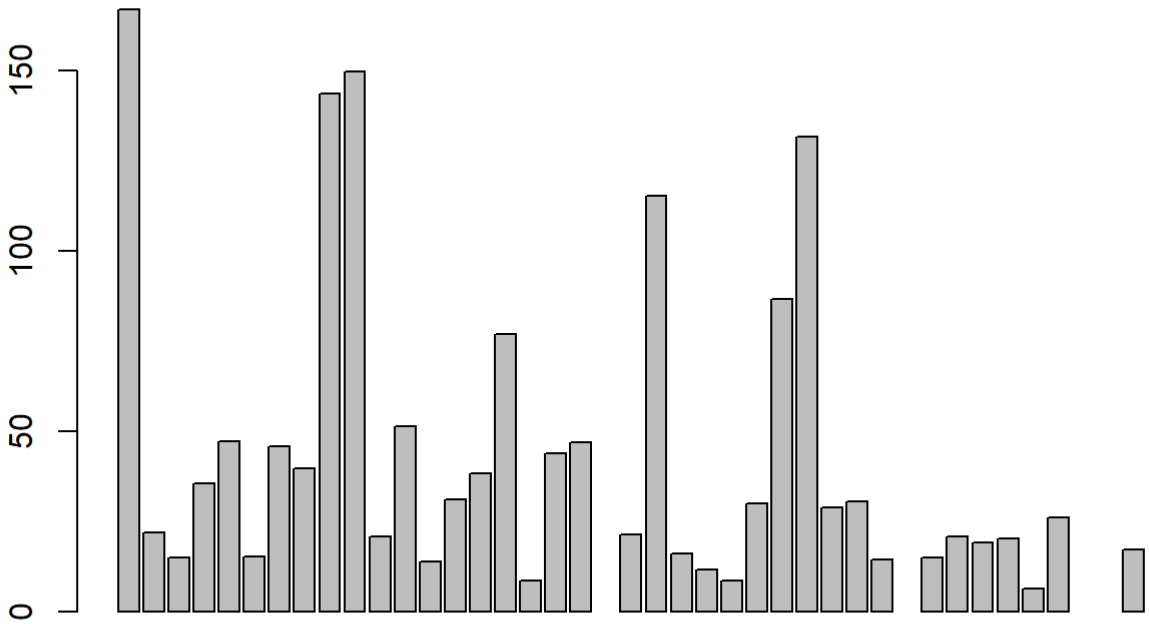
```
barplot(NewEurocrimedata$Assault)
```



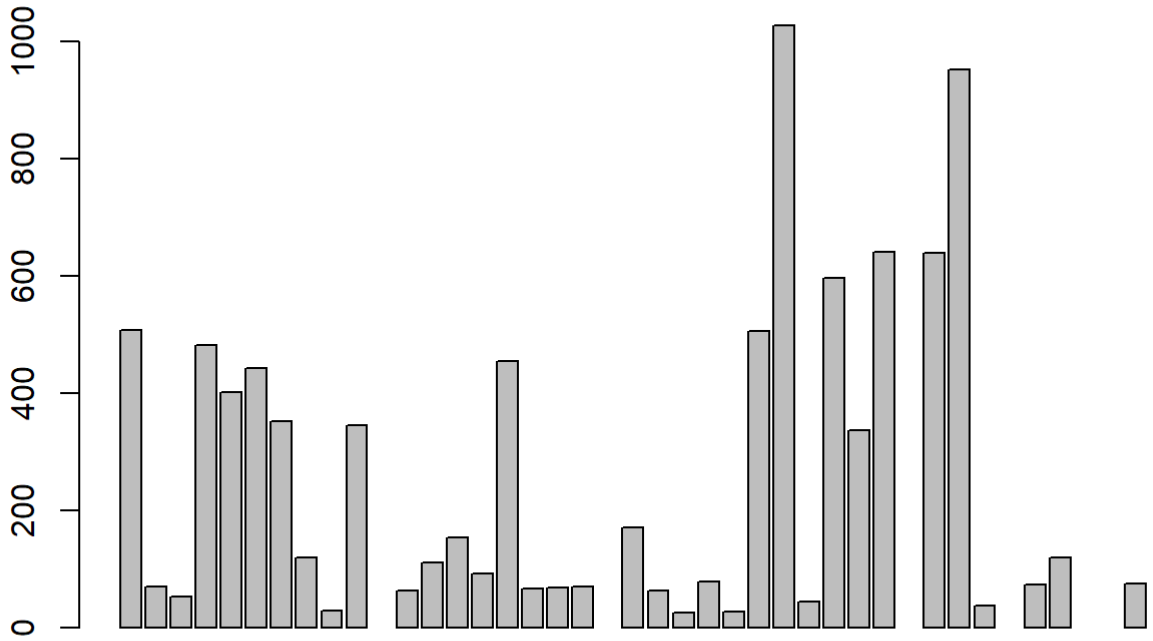

```
barplot(NewEurocrimedata$Kidnapping)
```



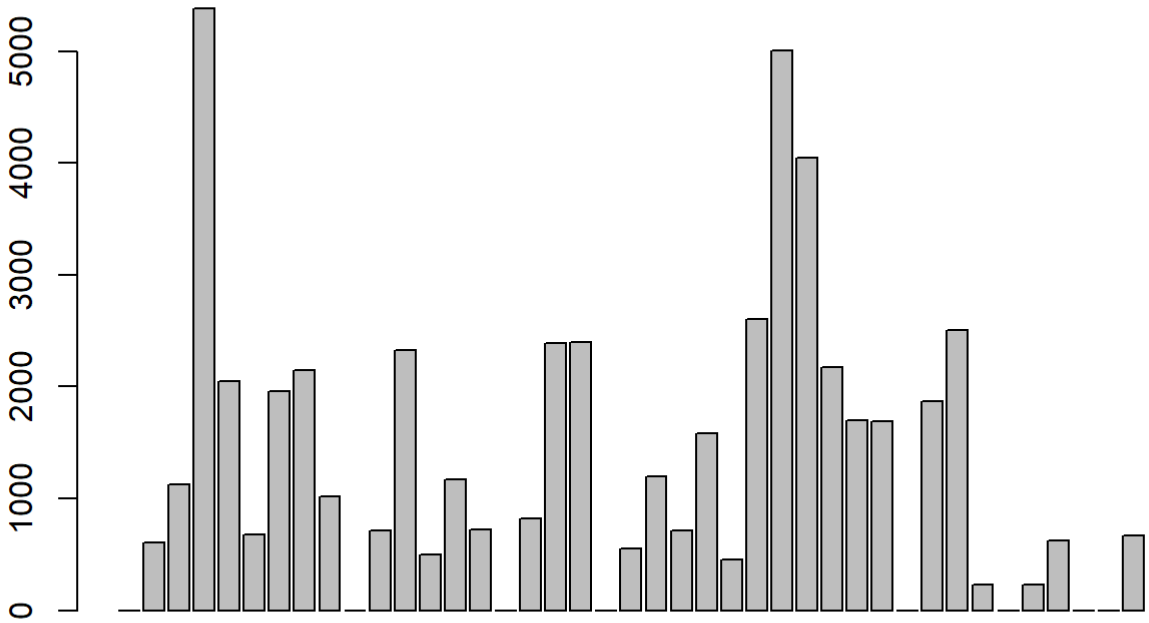

```
barplot(NewEurocrimedata$Robbery)
```



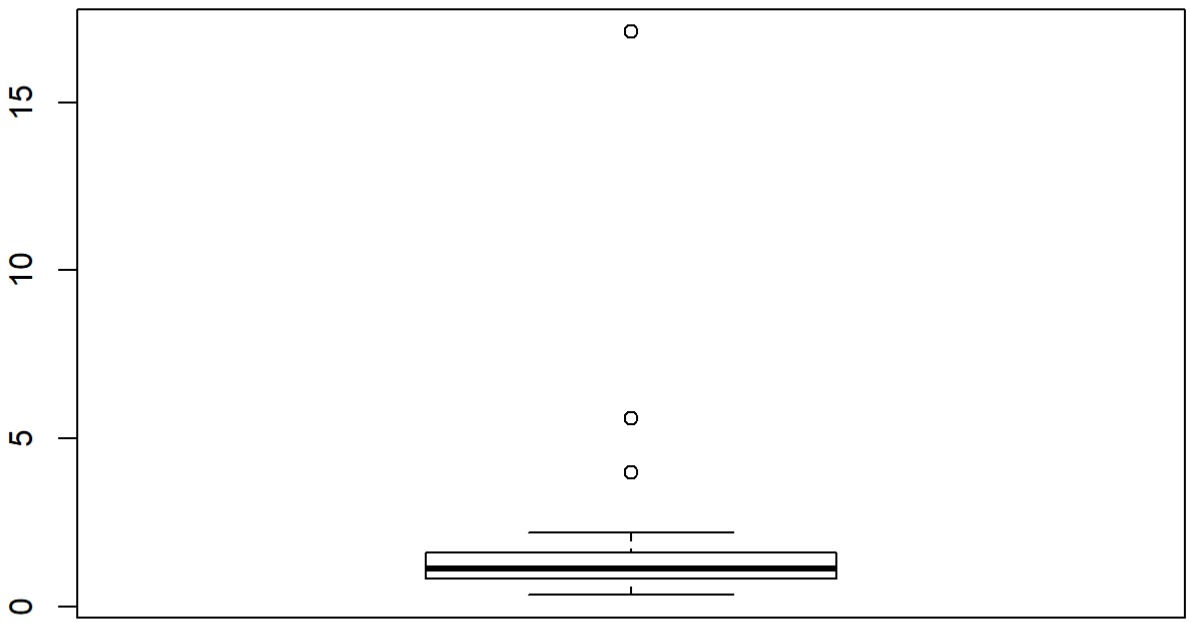
```
barplot(NewEurocrimedata$Unlawful_acts_involving_controlled_drugs_or_precursors)
```



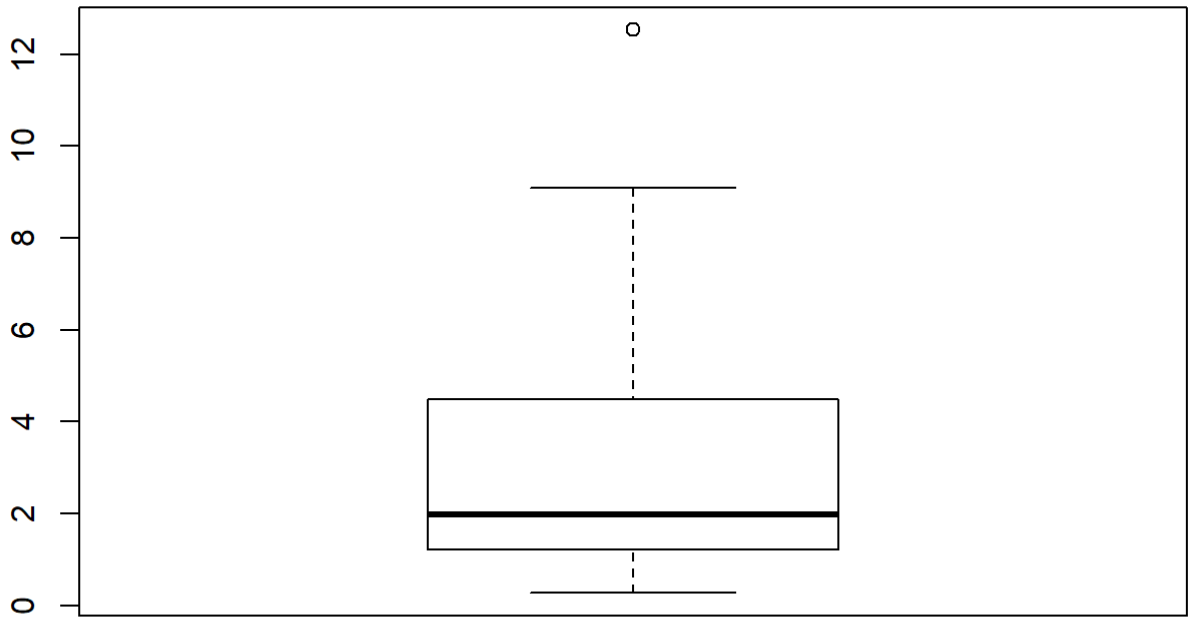

```
barplot(NewEurocrimedata$All_Theft)
```



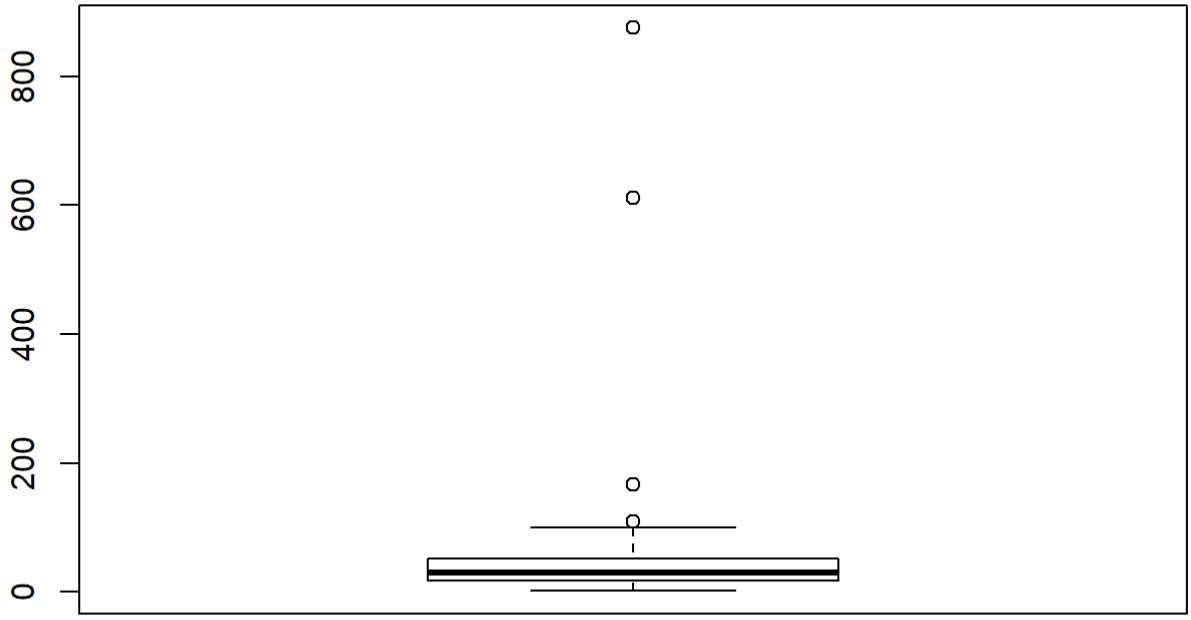

```
boxplot(NewEurocrimedata$Intentional_homicide)
```



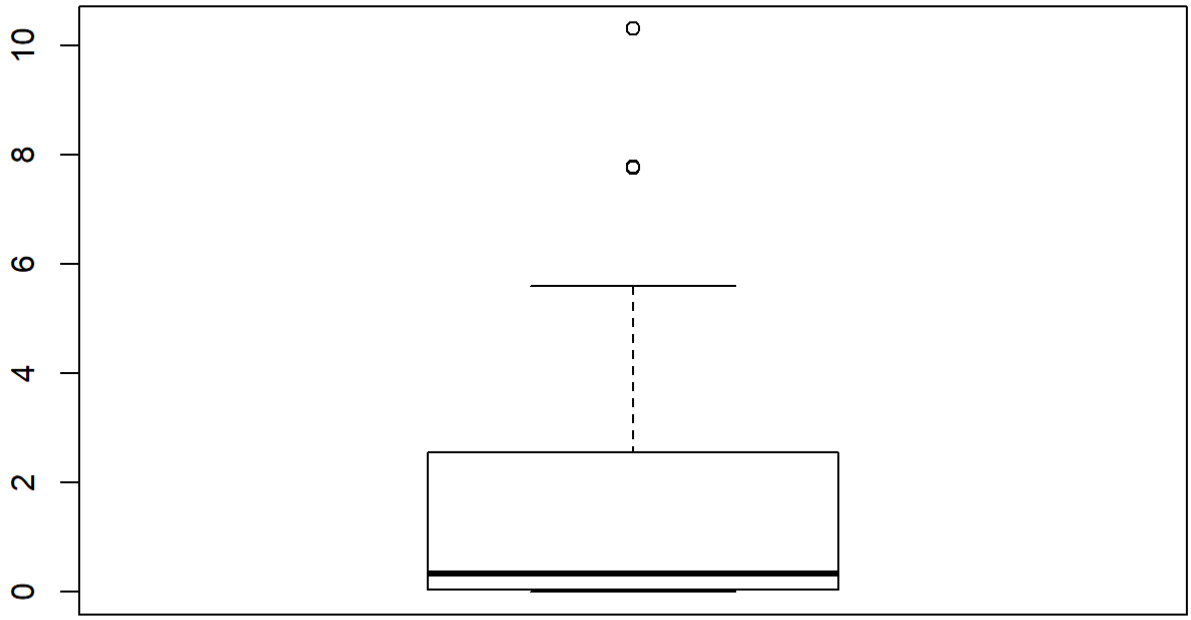
```
boxplot(NewEurocrimedata$Attempted_intentional_homicide)
```



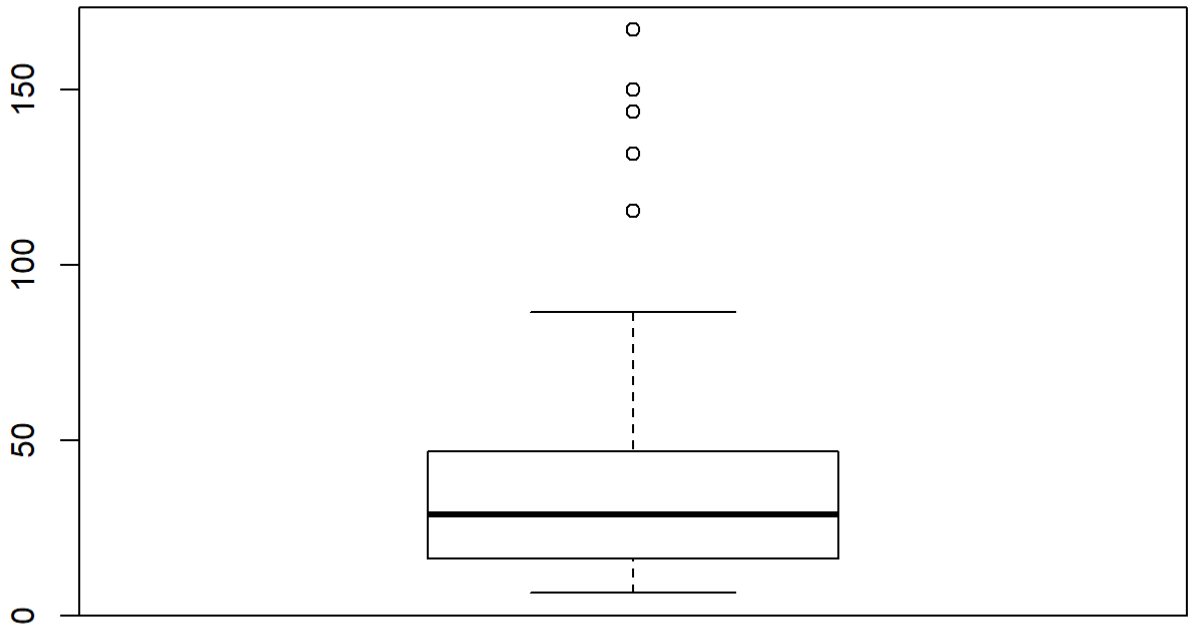

```
boxplot(NewEurocrimedata$Assault)
```



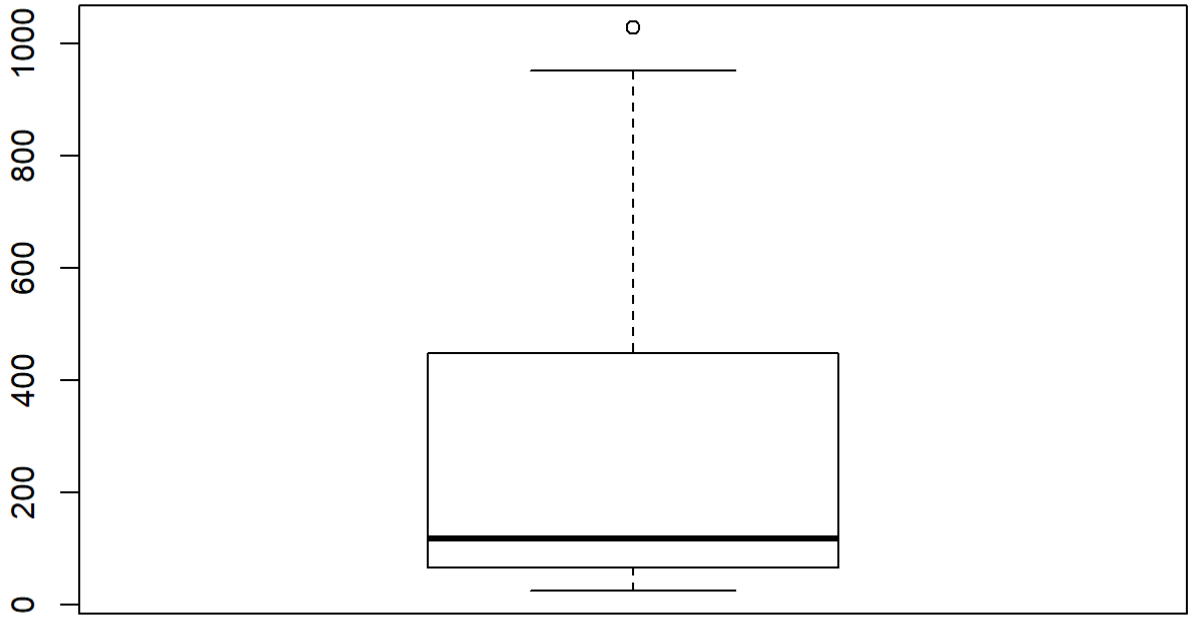

```
boxplot(NewEurocrimedata$Kidnapping)
```



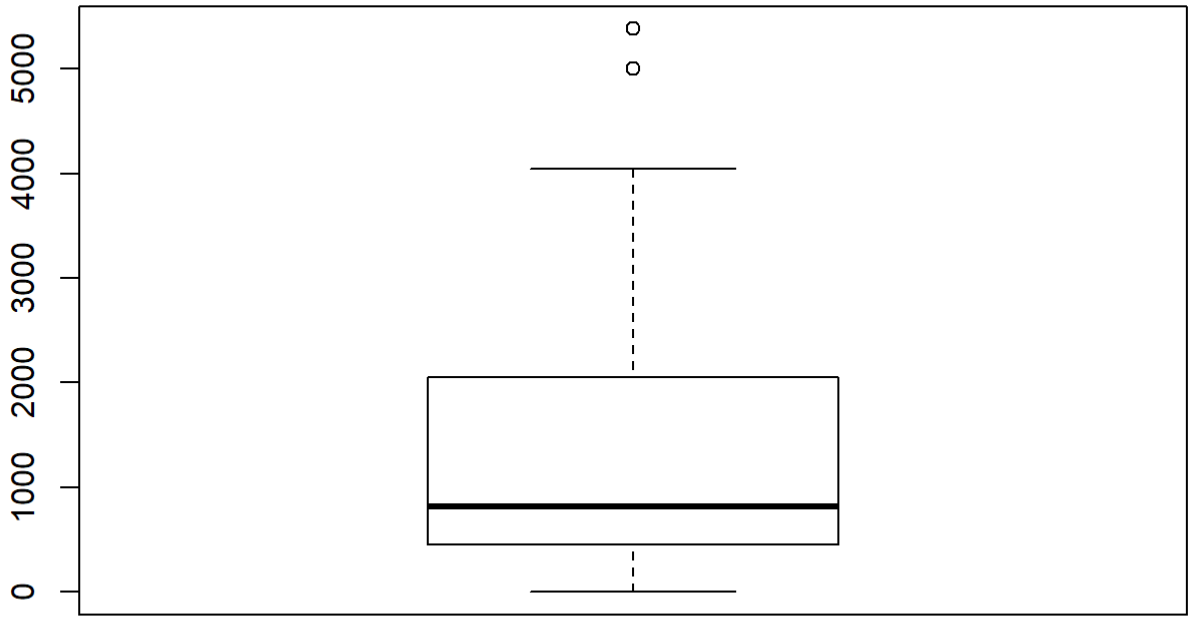
```
boxplot(NewEurocrimedata$Robbery)
```




```
boxplot(NewEurocrimedata$Unlawful_acts_involving_controlled_drugs_or_precursors)
```




```
boxplot(NewEurocrimedata$All_Theft)
```



```
pairs(NewEurocrimedata)
```