Implications for construction quality and sustainability

Statistical Modelling

2024-08-05

```
#Import the dataset(Copy of Concrete_Data)

Data<-read.csv("C:\\Users\\RISINA\\Desktop\\Group 03-Project report\\Copy of
Concrete_Data.csv")

colnames(Data)<-
c("Cement","Blast_Furnace_Slag","Fly_Ash","Water","Superplasticizer","Coarse_
Aggregate","Fine_Aggregate","Age_day","Concrete_compressive_strength")

names(Data)

## [1] "Cement"                         "Blast_Furnace_Slag"
## [3] "Fly_Ash"                        "Water"
## [5] "Superplasticizer"               "Coarse_Aggregate"
## [7] "Fine_Aggregate"                 "Age_day"
## [9] "Concrete_compressive_strength"

head(Data)

##   Cement Blast_Furnace_Slag Fly_Ash Water Superplasticizer
Coarse_Aggregate
## 1  540.0                0.0       0   162              2.5
1040.0
## 2  540.0                0.0       0   162              2.5
1055.0
## 3  332.5              142.5       0   228              0.0
932.0
## 4  332.5              142.5       0   228              0.0
932.0
## 5  198.6              132.4       0   192              0.0
978.4
## 6  266.0              114.0       0   228              0.0
932.0
##   Fine_Aggregate Age_day Concrete_compressive_strength
## 1          676.0      28                         79.99
## 2          676.0      28                         61.89
## 3          594.0     270                         40.27
## 4          594.0     365                         41.05
## 5          825.5     360                         44.30
## 6          670.0      90                         47.03

nrow(Data)

## [1] 1030
```

```
###Missing values

print("Total of Missing values")

## [1] "Total of Missing values"

sum(is.na(Data))

## [1] 0

colSums(is.na(Data))

##                         Cement            Blast_Furnace_Slag
##                              0                             0
##                        Fly_Ash                         Water
##                              0                             0
##              Superplasticizer              Coarse_Aggregate
##                              0                             0
##                Fine_Aggregate                       Age_day
##                              0                             0
## Concrete_compressive_strength
##                              0
```

This data set has no missing values.

```
##########Descriptive Analysis##########

#################Cement############

##Summary

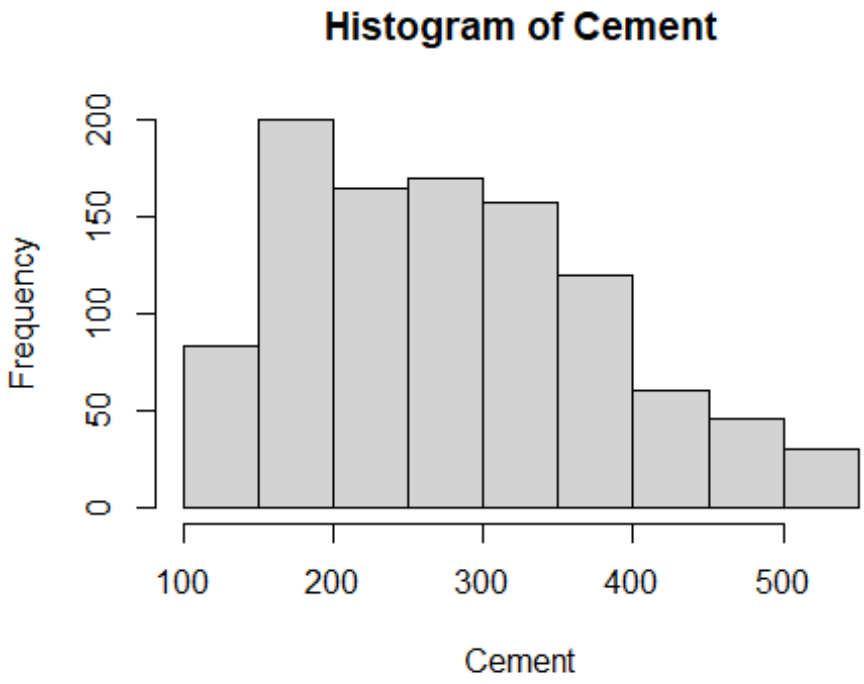
summary(Data$Cement)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   102.0   192.4   272.9   281.2   350.0   540.0

sd(Data$Cement)

## [1] 104.5064

##Histogram
hist(Data$Cement,xlab = "Cement",main="Histogram of Cement")
```



##Interpretation

∗There is a peak in the cement content distribution between 150 and 200 units, which is right-skewed. ∗The values of cement content are roughly between 100 and 550 units. ∗As the value rises, the frequency of cement content falls, suggesting a greater percentage of samples with lower cement concentration.

```
##################Blast_Furnace_Slag#############

##Summary

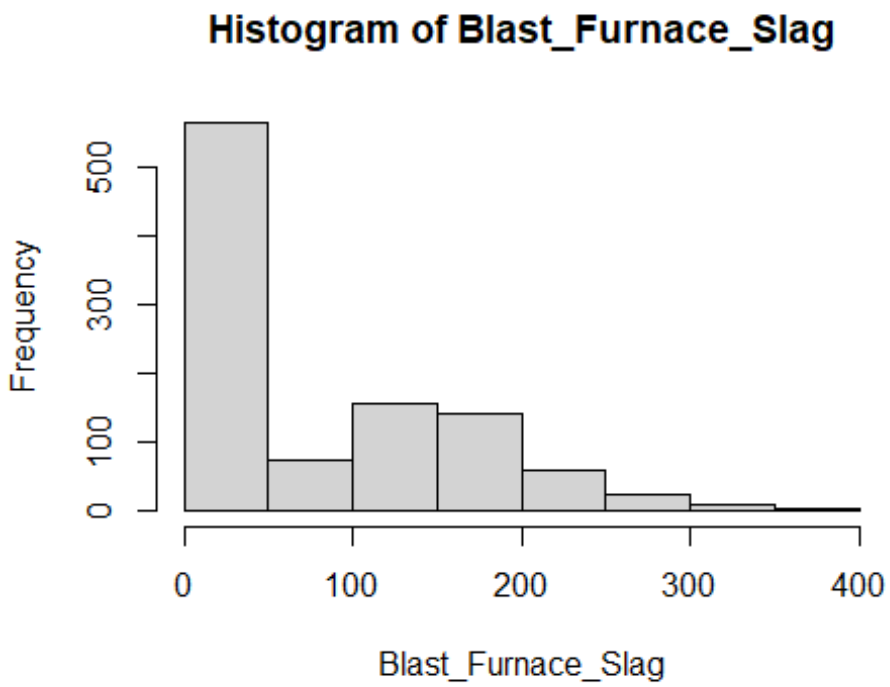
summary(Data$Blast_Furnace_Slag)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##     0.0     0.0    22.0    73.9   142.9   359.4

sd(Data$Blast_Furnace_Slag)

## [1] 86.27934

##Histogram
hist(Data$Blast_Furnace_Slag,xlab = "Blast_Furnace_Slag",main="Histogram of
Blast_Furnace_Slag")
```



####Interpretation *The data has a lengthy tail that points towards greater amounts of blast furnace slag and is biased to the right (positively skewed).

```
##################Fly_Ash#############

##Summary

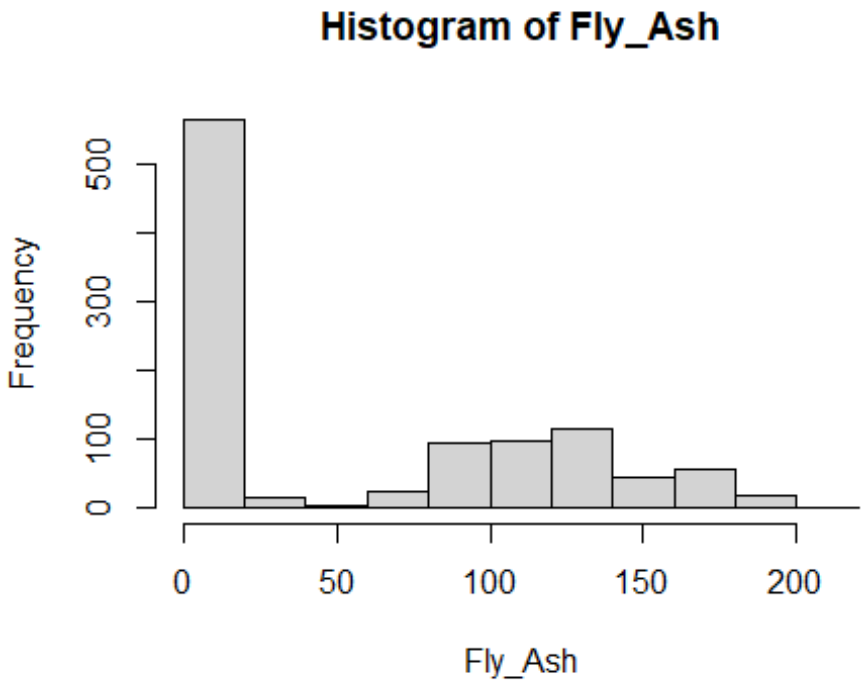
summary(Data$Fly_Ash)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    0.00    0.00    0.00   54.19  118.30  200.10

sd(Data$Fly_Ash)

## [1] 63.997

##Histogram
hist(Data$Fly_Ash,xlab = "Fly_Ash",main="Histogram of Fly_Ash")
```



###Interpretation

*A long tail points in the direction of higher values, and the distribution is biased to the right.

```
##################Water#############

##Summary

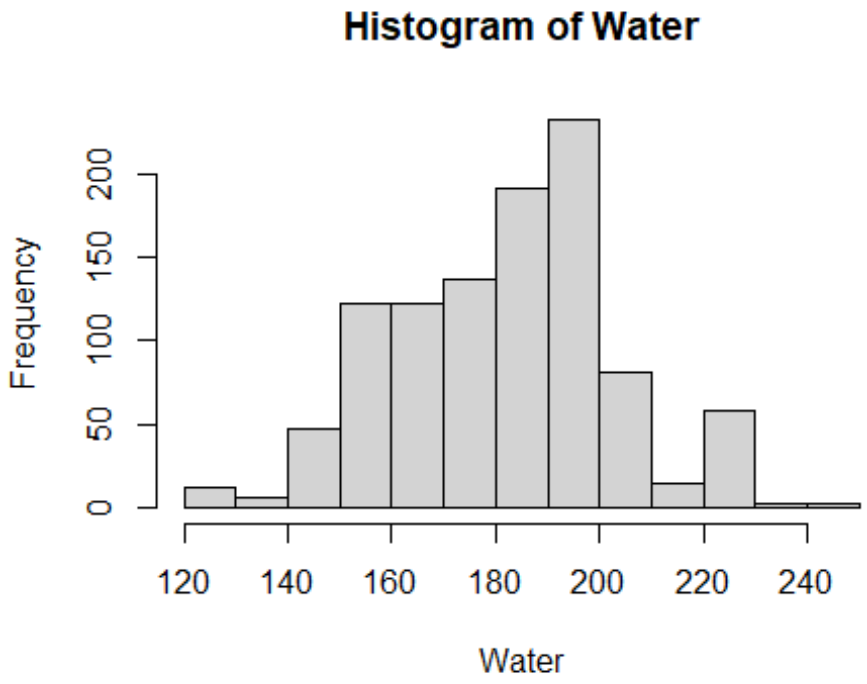
summary(Data$Water)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   121.8   164.9   185.0   181.6   192.0   247.0

sd(Data$Water)

## [1] 21.35422

##Histogram
hist(Data$Water,xlab = "Water",main="Histogram of Water")
```



####Interpretation *There is a peak in the water content distribution between middle, which is normally distributed.

```
###############Superplasticizer############

##Summary

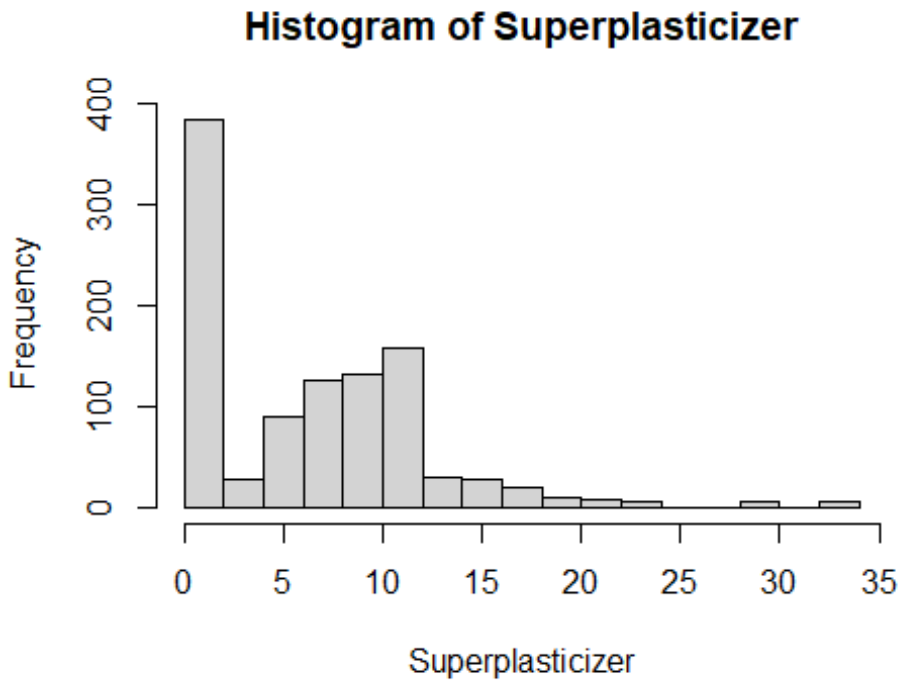
summary(Data$Superplasticizer)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   0.000   0.000   6.400   6.205  10.200  32.200

sd(Data$Superplasticizer)

## [1] 5.973841

##Histogram
hist(Data$Superplasticizer,xlab = "Superplasticizer",main="Histogram of
Superplasticizer")
```



######Interpretation *There is a lengthy tail pointing towards higher values and a skew to the right in the data.

```
###############Coarse_Aggregate############

##Summary

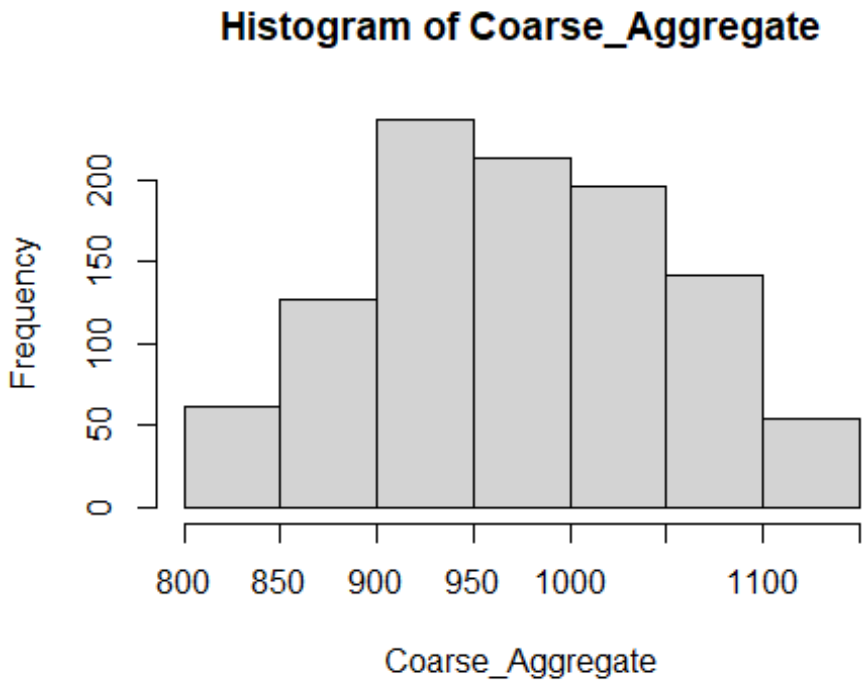
summary(Data$Coarse_Aggregate)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   801.0   932.0   968.0   972.9  1029.4  1145.0

sd(Data$Coarse_Aggregate)

## [1] 77.75395

##Histogram
hist(Data$Coarse_Aggregate,xlab = "Coarse_Aggregate",main="Histogram of
Coarse_Aggregate")
```



#####Interpretation *A normal distribution of coarse aggregate sizes in the concrete mix is suggested by the histogram, which has a bell-shaped approximate form.

```
################Fine_Aggregate#############

##Summary

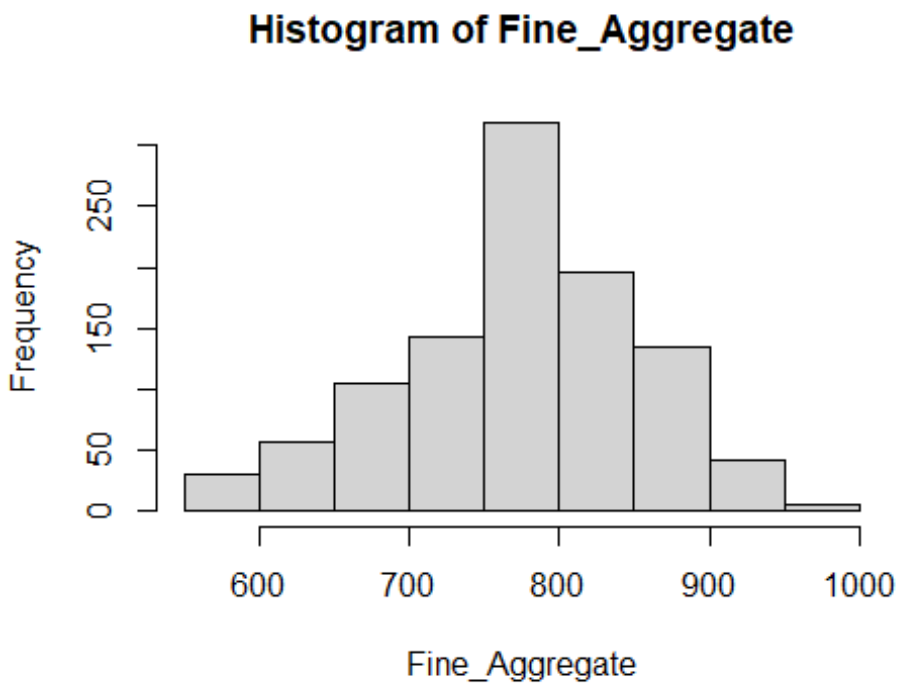
summary(Data$Fine_Aggregate)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   594.0   731.0   779.5   773.6   824.0   992.6

sd(Data$Fine_Aggregate)

## [1] 80.17598

##Histogram
hist(Data$Fine_Aggregate,xlab = "Fine_Aggregate",main="Histogram of
Fine_Aggregate")
```



###Interpretation

*A normal distribution of fine aggregate sizes in the concrete mix is suggested by the histogram, which has a bell-shaped approximate form.

```
################`Age_day`#############

##Summary

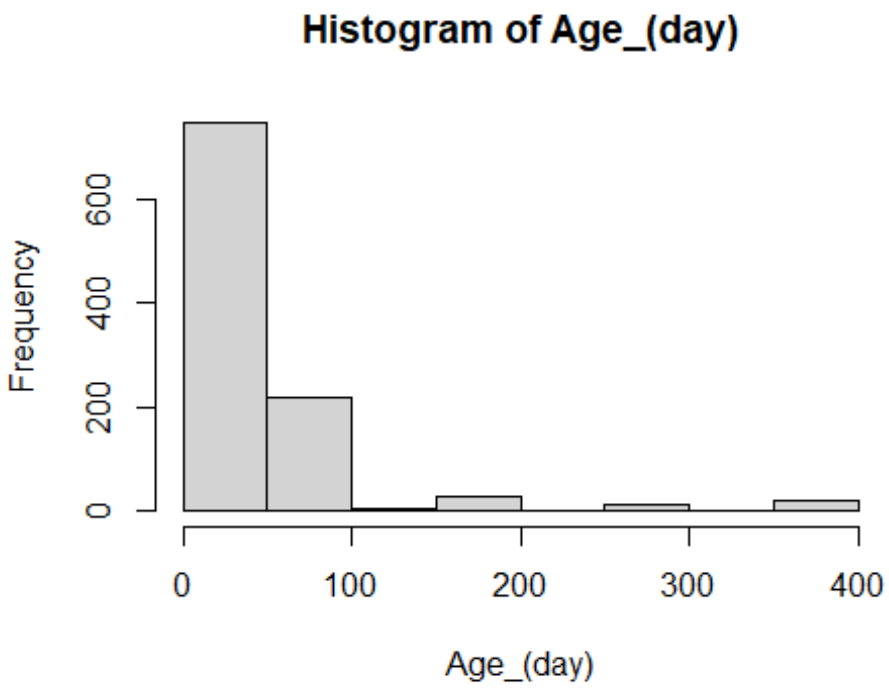
summary(Data$Age_day)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    1.00    7.00   28.00   45.66   56.00  365.00

sd(Data$Age_day)

## [1] 63.16991

##Histogram
hist(Data$Age_day,xlab = "Age_(day)",main="Histogram of Age_(day)")
```



###Interpretation

*There is a significant leftward bias in the data, with many samples falling within the beginning age range of 0–100 days.

```
###############Concrete_compressive_strength############

##Summary

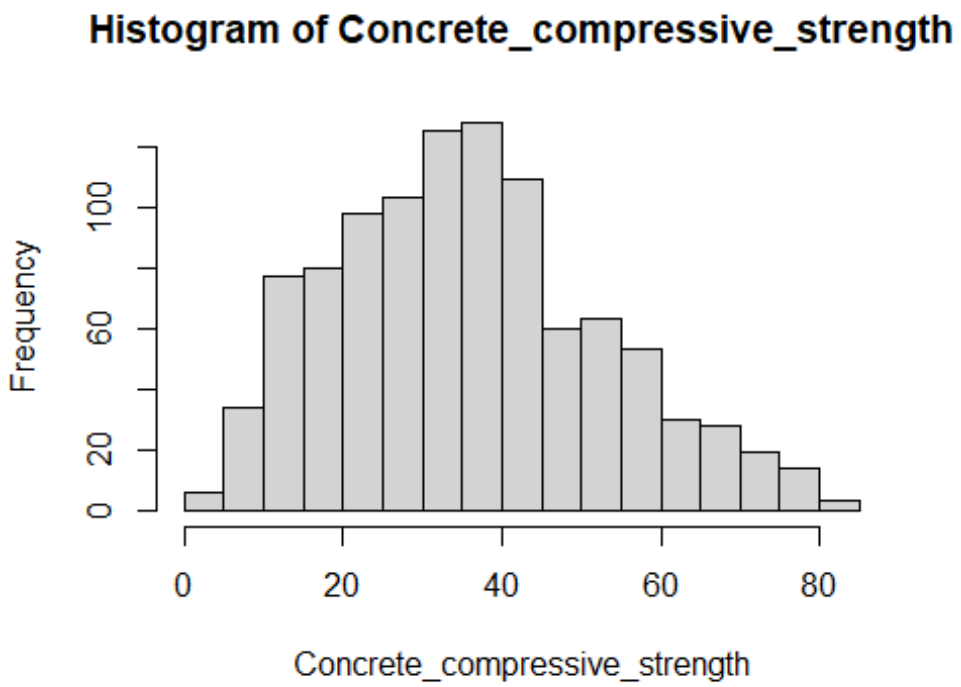
summary(Data$Concrete_compressive_strength)

##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    2.33   23.71   34.45   35.82   46.13   82.60

sd(Data$Concrete_compressive_strength)

## [1] 16.70574

##Histogram
hist(Data$Concrete_compressive_strength,xlab =
"Concrete_compressive_strength",main="Histogram of
Concrete_compressive_strength")
```



####Interpretation

*The histogram is roughly bell-shaped, suggesting that the concrete compressive strength values are approximately normally distributed.

```
####Outliers


# create detect outlier function
detect_outlier <- function(x) {

  # calculate first quantile
  Quantile1 <- quantile(x, probs=.25)

  # calculate third quantile
  Quantile3 <- quantile(x, probs=.75)

  # calculate interquartile range
  IQR = Quantile3 - Quantile1

  # return true or false
  x > Quantile3 + (IQR * 1.5) | x < Quantile1 - (IQR * 1.5)
}

# create remove outlier function
remove_outlier <- function(dataframe, columns = names(dataframe)) {
```

```
  # for loop to traverse in columns vector
  for (col in columns) {

    # remove observation if it satisfies outlier function
    dataframe <- dataframe[!detect_outlier(dataframe[[col]]), ]
  }

  print("Remove outliers")
  print(dataframe)
}

cleaned_data_1<-remove_outlier(Data,
c('Cement','Blast_Furnace_Slag','Fly_Ash','Water','Superplasticizer','Coarse_
Aggregate','Fine_Aggregate','Age_day','Concrete_compressive_strength'))
```

```
## [1] "Remove outliers"
##      Cement Blast_Furnace_Slag Fly_Ash Water Superplasticizer
Coarse_Aggregate
## 2     540.0                0.0     0.0 162.0              2.5
1055.0
## 6     266.0              114.0     0.0 228.0              0.0
932.0
## 9     266.0              114.0     0.0 228.0              0.0
932.0
## 11    198.6              132.4     0.0 192.0              0.0
978.4
## 12    198.6              132.4     0.0 192.0              0.0
978.4
## 14    190.0              190.0     0.0 228.0              0.0
932.0
## 15    304.0               76.0     0.0 228.0              0.0
932.0
## 16    380.0                0.0     0.0 228.0              0.0
932.0
## 17    139.6              209.4     0.0 192.0              0.0
1047.0
## 22    139.6              209.4     0.0 192.0              0.0
1047.0
## 23    139.6              209.4     0.0 192.0              0.0
1047.0
## 41    342.0               38.0     0.0 228.0              0.0
932.0
## 47    349.0                0.0     0.0 192.0              0.0
1047.0
## 54    304.0               76.0     0.0 228.0              0.0
932.0
## 55    139.6              209.4     0.0 192.0              0.0
1047.0
## 56    198.6              132.4     0.0 192.0              0.0
978.4
```

```
## 58    198.6              132.4     0.0 192.0              0.0
978.4
## 63    310.0                0.0     0.0 192.0              0.0
971.0
## 69    190.0              190.0     0.0 228.0              0.0
932.0
## 70    485.0                0.0     0.0 146.0              0.0
1120.0
## 71    374.0              189.2     0.0 170.1             10.1
926.1
## 72    313.3              262.2     0.0 175.5              8.6
1046.9
## 73    425.0              106.3     0.0 153.5             16.5
852.1
## 74    425.0              106.3     0.0 151.4             18.6
936.0
## 76    475.0              118.8     0.0 181.1              8.9
852.1
## 78    425.0              106.3     0.0 153.5             16.5
852.1
## 79    388.6               97.1     0.0 157.9             12.1
852.1
## 81    425.0              106.3     0.0 153.5             16.5
852.1
## 82    318.8              212.5     0.0 155.7             14.3
852.1
## 83    401.8               94.7     0.0 147.4             11.4
946.8
## 84    362.6              189.0     0.0 164.9             11.6
944.7
## 85    323.7              282.8     0.0 183.8             10.3
942.7
## 86    379.5              151.2     0.0 153.9             15.9
1134.3
## 87    362.6              189.0     0.0 164.9             11.6
944.7
## 88    286.3              200.9     0.0 144.7             11.2
1004.6
## 89    362.6              189.0     0.0 164.9             11.6
944.7
## 90    439.0              177.0     0.0 186.0             11.1
884.9
## 91    389.9              189.0     0.0 145.9             22.0
944.7
## 92    362.6              189.0     0.0 164.9             11.6
944.7
## 93    337.9              189.0     0.0 174.9              9.5
944.7
## 94    374.0              189.2     0.0 170.1             10.1
926.1
```

```
## 95    313.3             262.2     0.0 175.5              8.6
1046.9
## 96    425.0             106.3     0.0 153.5             16.5
852.1
## 97    425.0             106.3     0.0 151.4             18.6
936.0
## 99    475.0             118.8     0.0 181.1              8.9
852.1
## 101   425.0             106.3     0.0 153.5             16.5
852.1
## 102   388.6              97.1     0.0 157.9             12.1
852.1
## 104   425.0             106.3     0.0 153.5             16.5
852.1
## 105   318.8             212.5     0.0 155.7             14.3
852.1
## 106   401.8              94.7     0.0 147.4             11.4
946.8
## 107   362.6             189.0     0.0 164.9             11.6
944.7
## 108   323.7             282.8     0.0 183.8             10.3
942.7
## 109   379.5             151.2     0.0 153.9             15.9
1134.3
## 110   362.6             189.0     0.0 164.9             11.6
944.7
## 111   286.3             200.9     0.0 144.7             11.2
1004.6
## 112   362.6             189.0     0.0 164.9             11.6
944.7
## 113   439.0             177.0     0.0 186.0             11.1
884.9
## 114   389.9             189.0     0.0 145.9             22.0
944.7
## 115   362.6             189.0     0.0 164.9             11.6
944.7
## 116   337.9             189.0     0.0 174.9              9.5
944.7
## 117   374.0             189.2     0.0 170.1             10.1
926.1
## 118   313.3             262.2     0.0 175.5              8.6
1046.9
## 119   425.0             106.3     0.0 153.5             16.5
852.1
## 120   425.0             106.3     0.0 151.4             18.6
936.0
## 122   475.0             118.8     0.0 181.1              8.9
852.1
## 124   425.0             106.3     0.0 153.5             16.5
852.1
```

```
## 125   388.6               97.1     0.0 157.9            12.1
852.1
## 127   425.0              106.3     0.0 153.5            16.5
852.1
## 128   318.8              212.5     0.0 155.7            14.3
852.1
## 129   401.8               94.7     0.0 147.4            11.4
946.8
## 130   362.6              189.0     0.0 164.9            11.6
944.7
## 131   323.7              282.8     0.0 183.8            10.3
942.7
## 132   379.5              151.2     0.0 153.9            15.9
1134.3
## 133   362.6              189.0     0.0 164.9            11.6
944.7
## 134   286.3              200.9     0.0 144.7            11.2
1004.6
## 135   362.6              189.0     0.0 164.9            11.6
944.7
## 136   439.0              177.0     0.0 186.0            11.1
884.9
## 137   389.9              189.0     0.0 145.9            22.0
944.7
## 138   362.6              189.0     0.0 164.9            11.6
944.7
## 139   337.9              189.0     0.0 174.9             9.5
944.7
## 140   374.0              189.2     0.0 170.1            10.1
926.1
## 141   313.3              262.2     0.0 175.5             8.6
1046.9
## 142   425.0              106.3     0.0 153.5            16.5
852.1
## 143   425.0              106.3     0.0 151.4            18.6
936.0
## 145   475.0              118.8     0.0 181.1             8.9
852.1
## 147   425.0              106.3     0.0 153.5            16.5
852.1
## 148   388.6               97.1     0.0 157.9            12.1
852.1
## 150   425.0              106.3     0.0 153.5            16.5
852.1
## 151   318.8              212.5     0.0 155.7            14.3
852.1
## 152   401.8               94.7     0.0 147.4            11.4
946.8
## 153   362.6              189.0     0.0 164.9            11.6
944.7
```

```
## 155   379.5             151.2     0.0 153.9            15.9
1134.3
## 156   362.6             189.0     0.0 164.9            11.6
944.7
## 157   286.3             200.9     0.0 144.7            11.2
1004.6
## 158   362.6             189.0     0.0 164.9            11.6
944.7
## 159   439.0             177.0     0.0 186.0            11.1
884.9
## 160   389.9             189.0     0.0 145.9            22.0
944.7
## 161   362.6             189.0     0.0 164.9            11.6
944.7
## 162   337.9             189.0     0.0 174.9             9.5
944.7
## 163   374.0             189.2     0.0 170.1            10.1
926.1
## 164   313.3             262.2     0.0 175.5             8.6
1046.9
## 165   425.0             106.3     0.0 153.5            16.5
852.1
## 166   425.0             106.3     0.0 151.4            18.6
936.0
## 168   475.0             118.8     0.0 181.1             8.9
852.1
## 170   425.0             106.3     0.0 153.5            16.5
852.1
## 171   388.6              97.1     0.0 157.9            12.1
852.1
## 173   425.0             106.3     0.0 153.5            16.5
852.1
## 174   318.8             212.5     0.0 155.7            14.3
852.1
## 175   401.8              94.7     0.0 147.4            11.4
946.8
## 176   362.6             189.0     0.0 164.9            11.6
944.7
## 177   379.5             151.2     0.0 153.9            15.9
1134.3
## 178   362.6             189.0     0.0 164.9            11.6
944.7
## 179   286.3             200.9     0.0 144.7            11.2
1004.6
## 180   362.6             189.0     0.0 164.9            11.6
944.7
## 181   439.0             177.0     0.0 186.0            11.1
884.9
## 183   362.6             189.0     0.0 164.9            11.6
944.7
```

```
## 184   337.9              189.0     0.0 174.9              9.5
944.7
## 185   222.4                0.0    96.7 189.3              4.5
967.1
## 186   222.4                0.0    96.7 189.3              4.5
967.1
## 187   222.4                0.0    96.7 189.3              4.5
967.1
## 188   222.4                0.0    96.7 189.3              4.5
967.1
## 189   222.4                0.0    96.7 189.3              4.5
967.1
## 190   233.8                0.0    94.6 197.9              4.6
947.0
## 191   233.8                0.0    94.6 197.9              4.6
947.0
## 192   233.8                0.0    94.6 197.9              4.6
947.0
## 193   233.8                0.0    94.6 197.9              4.6
947.0
## 194   233.8                0.0    94.6 197.9              4.6
947.0
## 195   194.7                0.0   100.5 165.6              7.5
1006.4
## 196   194.7                0.0   100.5 165.6              7.5
1006.4
## 197   194.7                0.0   100.5 165.6              7.5
1006.4
## 198   194.7                0.0   100.5 165.6              7.5
1006.4
## 199   194.7                0.0   100.5 165.6              7.5
1006.4
## 200   190.7                0.0   125.4 162.1              7.8
1090.0
## 201   190.7                0.0   125.4 162.1              7.8
1090.0
## 202   190.7                0.0   125.4 162.1              7.8
1090.0
## 203   190.7                0.0   125.4 162.1              7.8
1090.0
## 204   190.7                0.0   125.4 162.1              7.8
1090.0
## 205   212.1                0.0   121.6 180.3              5.7
1057.6
## 206   212.1                0.0   121.6 180.3              5.7
1057.6
## 207   212.1                0.0   121.6 180.3              5.7
1057.6
## 208   212.1                0.0   121.6 180.3              5.7
1057.6
```

```
## 209   212.1                0.0   121.6 180.3              5.7
1057.6
## 210   230.0                0.0   118.3 195.5              4.6
1029.4
## 211   230.0                0.0   118.3 195.5              4.6
1029.4
## 212   230.0                0.0   118.3 195.5              4.6
1029.4
## 213   230.0                0.0   118.3 195.5              4.6
1029.4
## 214   230.0                0.0   118.3 195.5              4.6
1029.4
## 215   190.3                0.0   125.2 161.9              9.9
1088.1
## 216   190.3                0.0   125.2 161.9              9.9
1088.1
## 217   190.3                0.0   125.2 161.9              9.9
1088.1
## 218   190.3                0.0   125.2 161.9              9.9
1088.1
## 219   190.3                0.0   125.2 161.9              9.9
1088.1
## 220   166.1                0.0   163.3 176.5              4.5
1058.6
## 221   166.1                0.0   163.3 176.5              4.5
1058.6
## 222   166.1                0.0   163.3 176.5              4.5
1058.6
## 223   166.1                0.0   163.3 176.5              4.5
1058.6
## 224   166.1                0.0   163.3 176.5              4.5
1058.6
## 230   213.7               98.1    24.5 181.7              6.9
1065.8
## 231   213.7               98.1    24.5 181.7              6.9
1065.8
## 232   213.7               98.1    24.5 181.7              6.9
1065.8
## 233   213.7               98.1    24.5 181.7              6.9
1065.8
## 234   213.7               98.1    24.5 181.7              6.9
1065.8
## 235   213.8               98.1    24.5 181.7              6.7
1066.0
## 236   213.8               98.1    24.5 181.7              6.7
1066.0
## 237   213.8               98.1    24.5 181.7              6.7
1066.0
## 238   213.8               98.1    24.5 181.7              6.7
1066.0
```

```
## 239   213.8               98.1    24.5 181.7              6.7
1066.0
## 240   229.7                0.0   118.2 195.2              6.1
1028.1
## 241   229.7                0.0   118.2 195.2              6.1
1028.1
## 242   229.7                0.0   118.2 195.2              6.1
1028.1
## 243   229.7                0.0   118.2 195.2              6.1
1028.1
## 244   229.7                0.0   118.2 195.2              6.1
1028.1
## 245   238.1                0.0    94.1 186.7              7.0
949.9
## 246   238.1                0.0    94.1 186.7              7.0
949.9
## 247   238.1                0.0    94.1 186.7              7.0
949.9
## 248   238.1                0.0    94.1 186.7              7.0
949.9
## 249   238.1                0.0    94.1 186.7              7.0
949.9
## 250   250.0                0.0    95.7 187.4              5.5
956.9
## 251   250.0                0.0    95.7 187.4              5.5
956.9
## 252   250.0                0.0    95.7 187.4              5.5
956.9
## 253   250.0                0.0    95.7 187.4              5.5
956.9
## 254   250.0                0.0    95.7 187.4              5.5
956.9
## 255   212.5                0.0   100.4 159.3              8.7
1007.8
## 256   212.5                0.0   100.4 159.3              8.7
1007.8
## 257   212.5                0.0   100.4 159.3              8.7
1007.8
## 258   212.5                0.0   100.4 159.3              8.7
1007.8
## 259   212.5                0.0   100.4 159.3              8.7
1007.8
## 260   212.6                0.0   100.4 159.4             10.4
1003.8
## 261   212.6                0.0   100.4 159.4             10.4
1003.8
## 262   212.6                0.0   100.4 159.4             10.4
1003.8
## 263   212.6                0.0   100.4 159.4             10.4
1003.8
```

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## 264   212.6               0.0   100.4 159.4             10.4
1003.8
## 265   212.0               0.0   124.8 159.0              7.8
1085.4
## 266   212.0               0.0   124.8 159.0              7.8
1085.4
## 267   212.0               0.0   124.8 159.0              7.8
1085.4
## 268   212.0               0.0   124.8 159.0              7.8
1085.4
## 269   212.0               0.0   124.8 159.0              7.8
1085.4
## 270   231.8               0.0   121.6 174.0              6.7
1056.4
## 271   231.8               0.0   121.6 174.0              6.7
1056.4
## 272   231.8               0.0   121.6 174.0              6.7
1056.4
## 273   231.8               0.0   121.6 174.0              6.7
1056.4
## 274   231.8               0.0   121.6 174.0              6.7
1056.4
## 275   251.4               0.0   118.3 188.5              5.8
1028.4
## 276   251.4               0.0   118.3 188.5              5.8
1028.4
## 277   251.4               0.0   118.3 188.5              5.8
1028.4
## 278   251.4               0.0   118.3 188.5              5.8
1028.4
## 279   251.4               0.0   118.3 188.5              5.8
1028.4
## 280   251.4               0.0   118.3 188.5              6.4
1028.4
## 281   251.4               0.0   118.3 188.5              6.4
1028.4
## 282   251.4               0.0   118.3 188.5              6.4
1028.4
## 283   251.4               0.0   118.3 188.5              6.4
1028.4
## 284   251.4               0.0   118.3 188.5              6.4
1028.4
## 285   181.4               0.0   167.0 169.6              7.6
1055.6
## 286   181.4               0.0   167.0 169.6              7.6
1055.6
## 287   181.4               0.0   167.0 169.6              7.6
1055.6
## 288   181.4               0.0   167.0 169.6              7.6
1055.6
```

```
## 289   181.4                0.0   167.0 169.6              7.6
1055.6
## 290   182.0               45.2   122.0 170.2              8.2
1059.4
## 291   182.0               45.2   122.0 170.2              8.2
1059.4
## 292   182.0               45.2   122.0 170.2              8.2
1059.4
## 293   182.0               45.2   122.0 170.2              8.2
1059.4
## 294   182.0               45.2   122.0 170.2              8.2
1059.4
## 295   168.9               42.2   124.3 158.3             10.8
1080.8
## 296   168.9               42.2   124.3 158.3             10.8
1080.8
## 297   168.9               42.2   124.3 158.3             10.8
1080.8
## 298   168.9               42.2   124.3 158.3             10.8
1080.8
## 299   168.9               42.2   124.3 158.3             10.8
1080.8
## 300   290.4                0.0    96.2 168.1              9.4
961.2
## 301   290.4                0.0    96.2 168.1              9.4
961.2
## 302   290.4                0.0    96.2 168.1              9.4
961.2
## 303   290.4                0.0    96.2 168.1              9.4
961.2
## 304   290.4                0.0    96.2 168.1              9.4
961.2
## 305   277.1                0.0    97.4 160.6             11.8
973.9
## 306   277.1                0.0    97.4 160.6             11.8
973.9
## 307   277.1                0.0    97.4 160.6             11.8
973.9
## 308   277.1                0.0    97.4 160.6             11.8
973.9
## 309   277.1                0.0    97.4 160.6             11.8
973.9
## 310   295.7                0.0    95.6 171.5              8.9
955.1
## 311   295.7                0.0    95.6 171.5              8.9
955.1
## 312   295.7                0.0    95.6 171.5              8.9
955.1
## 313   295.7                0.0    95.6 171.5              8.9
955.1
```

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## 314   295.7               0.0    95.6 171.5              8.9
955.1
## 315   251.8               0.0    99.9 146.1             12.4
1006.0
## 316   251.8               0.0    99.9 146.1             12.4
1006.0
## 317   251.8               0.0    99.9 146.1             12.4
1006.0
## 318   251.8               0.0    99.9 146.1             12.4
1006.0
## 319   251.8               0.0    99.9 146.1             12.4
1006.0
## 320   249.1               0.0    98.8 158.1             12.8
987.8
## 321   249.1               0.0    98.8 158.1             12.8
987.8
## 322   249.1               0.0    98.8 158.1             12.8
987.8
## 323   249.1               0.0    98.8 158.1             12.8
987.8
## 324   249.1               0.0    98.8 158.1             12.8
987.8
## 325   252.3               0.0    98.8 146.3             14.2
987.8
## 326   252.3               0.0    98.8 146.3             14.2
987.8
## 327   252.3               0.0    98.8 146.3             14.2
987.8
## 328   252.3               0.0    98.8 146.3             14.2
987.8
## 329   252.3               0.0    98.8 146.3             14.2
987.8
## 330   246.8               0.0   125.1 143.3             12.0
1086.8
## 331   246.8               0.0   125.1 143.3             12.0
1086.8
## 332   246.8               0.0   125.1 143.3             12.0
1086.8
## 333   246.8               0.0   125.1 143.3             12.0
1086.8
## 334   246.8               0.0   125.1 143.3             12.0
1086.8
## 335   275.1               0.0   121.4 159.5              9.9
1053.6
## 336   275.1               0.0   121.4 159.5              9.9
1053.6
## 337   275.1               0.0   121.4 159.5              9.9
1053.6
## 338   275.1               0.0   121.4 159.5              9.9
1053.6
```

```
## 339   275.1                0.0   121.4 159.5              9.9
1053.6
## 340   297.2                0.0   117.5 174.8              9.5
1022.8
## 341   297.2                0.0   117.5 174.8              9.5
1022.8
## 342   297.2                0.0   117.5 174.8              9.5
1022.8
## 343   297.2                0.0   117.5 174.8              9.5
1022.8
## 344   297.2                0.0   117.5 174.8              9.5
1022.8
## 345   213.7                0.0   174.7 154.8             10.2
1053.5
## 346   213.7                0.0   174.7 154.8             10.2
1053.5
## 347   213.7                0.0   174.7 154.8             10.2
1053.5
## 348   213.7                0.0   174.7 154.8             10.2
1053.5
## 349   213.7                0.0   174.7 154.8             10.2
1053.5
## 350   213.5                0.0   174.2 154.6             11.7
1052.3
## 351   213.5                0.0   174.2 154.6             11.7
1052.3
## 352   213.5                0.0   174.2 154.6             11.7
1052.3
## 353   213.5                0.0   174.2 154.6             11.7
1052.3
## 354   213.5                0.0   174.2 154.6             11.7
1052.3
## 355   277.2               97.8    24.5 160.7             11.2
1061.7
## 356   277.2               97.8    24.5 160.7             11.2
1061.7
## 357   277.2               97.8    24.5 160.7             11.2
1061.7
## 358   277.2               97.8    24.5 160.7             11.2
1061.7
## 359   277.2               97.8    24.5 160.7             11.2
1061.7
## 360   218.2               54.6   123.8 140.8             11.9
1075.7
## 361   218.2               54.6   123.8 140.8             11.9
1075.7
## 362   218.2               54.6   123.8 140.8             11.9
1075.7
## 363   218.2               54.6   123.8 140.8             11.9
1075.7
```

```
## 364   218.2               54.6   123.8 140.8             11.9
1075.7
## 365   214.9               53.8   121.9 155.6              9.6
1014.3
## 366   214.9               53.8   121.9 155.6              9.6
1014.3
## 367   214.9               53.8   121.9 155.6              9.6
1014.3
## 368   214.9               53.8   121.9 155.6              9.6
1014.3
## 369   214.9               53.8   121.9 155.6              9.6
1014.3
## 370   218.9                0.0   124.1 158.5             11.3
1078.7
## 371   218.9                0.0   124.1 158.5             11.3
1078.7
## 372   218.9                0.0   124.1 158.5             11.3
1078.7
## 373   218.9                0.0   124.1 158.5             11.3
1078.7
## 374   218.9                0.0   124.1 158.5             11.3
1078.7
## 375   376.0                0.0     0.0 214.6              0.0
1003.5
## 376   376.0                0.0     0.0 214.6              0.0
1003.5
## 377   376.0                0.0     0.0 214.6              0.0
1003.5
## 378   376.0                0.0     0.0 214.6              0.0
1003.5
## 379   376.0                0.0     0.0 214.6              0.0
1003.5
## 380   500.0                0.0     0.0 140.0              4.0
966.0
## 381   475.0                0.0    59.0 142.0              1.9
1098.0
## 383   505.0                0.0    60.0 195.0              0.0
1030.0
## 384   451.0                0.0     0.0 165.0             11.3
1030.0
## 385   516.0                0.0     0.0 162.0              8.2
801.0
## 386   520.0                0.0     0.0 170.0              5.2
855.0
## 387   528.0                0.0     0.0 185.0              6.9
920.0
## 388   520.0                0.0     0.0 175.0              5.2
870.0
## 389   385.0                0.0   136.0 158.0             20.0
903.0
```

```
## 390   500.1               0.0     0.0 200.0              3.0
1124.4
## 391   450.1              50.0     0.0 200.0              3.0
1124.4
## 392   397.0              17.2   158.0 167.0             20.8
967.0
## 393   333.0              17.5   163.0 167.0             17.9
996.0
## 394   334.0              17.6   158.0 189.0             15.3
967.0
## 395   405.0               0.0     0.0 175.0              0.0
1120.0
## 396   200.0             200.0     0.0 190.0              0.0
1145.0
## 397   516.0               0.0     0.0 162.0              8.3
801.0
## 398   145.0             116.0   119.0 184.0              5.7
833.0
## 399   160.0             128.0   122.0 182.0              6.4
824.0
## 400   234.0             156.0     0.0 189.0              5.9
981.0
## 401   250.0             180.0    95.0 159.0              9.5
860.0
## 402   475.0               0.0     0.0 162.0              9.5
1044.0
## 403   285.0             190.0     0.0 163.0              7.6
1031.0
## 404   356.0             119.0     0.0 160.0              9.0
1061.0
## 405   275.0             180.0   120.0 162.0             10.4
830.0
## 406   500.0               0.0     0.0 151.0              9.0
1033.0
## 407   165.0               0.0   143.6 163.8              0.0
1005.6
## 408   165.0             128.5   132.1 175.1              8.1
1005.8
## 409   178.0             129.8   118.6 179.9              3.6
1007.3
## 410   167.4             129.9   128.6 175.5              7.8
1006.3
## 411   172.4              13.6   172.4 156.8              4.1
1006.3
## 412   173.5              50.1   173.5 164.8              6.5
1006.2
## 413   167.0              75.4   167.0 164.0              7.9
1007.3
## 414   173.8              93.4   159.9 172.3              9.7
1007.2
```

```
## 415   190.3               0.0   125.2 166.6              9.9
1079.0
## 416   250.0               0.0    95.7 191.8              5.3
948.9
## 417   213.5               0.0   174.2 159.2             11.7
1043.6
## 418   194.7               0.0   100.5 170.2              7.5
998.0
## 419   251.4               0.0   118.3 192.9              5.8
1043.6
## 420   165.0               0.0   143.6 163.8              0.0
1005.6
## 421   165.0             128.5   132.1 175.1              8.1
1005.8
## 422   178.0             129.8   118.6 179.9              3.6
1007.3
## 423   167.4             129.9   128.6 175.5              7.8
1006.3
## 424   172.4              13.6   172.4 156.8              4.1
1006.3
## 425   173.5              50.1   173.5 164.8              6.5
1006.2
## 426   167.0              75.4   167.0 164.0              7.9
1007.3
## 427   173.8              93.4   159.9 172.3              9.7
1007.2
## 428   190.3               0.0   125.2 166.6              9.9
1079.0
## 429   250.0               0.0    95.7 191.8              5.3
948.9
## 430   213.5               0.0   174.2 159.2             11.7
1043.6
## 431   194.7               0.0   100.5 170.2              7.5
998.0
## 432   251.4               0.0   118.3 192.9              5.8
1043.6
## 433   165.0               0.0   143.6 163.8              0.0
1005.6
## 434   165.0             128.5   132.1 175.1              8.1
1005.8
## 435   178.0             129.8   118.6 179.9              3.6
1007.3
## 436   167.4             129.9   128.6 175.5              7.8
1006.3
## 437   172.4              13.6   172.4 156.8              4.1
1006.3
## 438   173.5              50.1   173.5 164.8              6.5
1006.2
## 439   167.0              75.4   167.0 164.0              7.9
1007.3
```

```
## 440   173.8              93.4   159.9 172.3             9.7
1007.2
## 441   190.3               0.0   125.2 166.6             9.9
1079.0
## 442   250.0               0.0    95.7 191.8             5.3
948.9
## 443   213.5               0.0   174.2 159.2            11.7
1043.6
## 444   194.7               0.0   100.5 170.2             7.5
998.0
## 445   251.4               0.0   118.3 192.9             5.8
1043.6
## 446   165.0               0.0   143.6 163.8             0.0
1005.6
## 447   165.0             128.5   132.1 175.1             8.1
1005.8
## 448   178.0             129.8   118.6 179.9             3.6
1007.3
## 449   167.4             129.9   128.6 175.5             7.8
1006.3
## 450   172.4              13.6   172.4 156.8             4.1
1006.3
## 451   173.5              50.1   173.5 164.8             6.5
1006.2
## 452   167.0              75.4   167.0 164.0             7.9
1007.3
## 453   173.8              93.4   159.9 172.3             9.7
1007.2
## 454   190.3               0.0   125.2 166.6             9.9
1079.0
## 455   250.0               0.0    95.7 191.8             5.3
948.9
## 456   213.5               0.0   174.2 159.2            11.7
1043.6
## 457   194.7               0.0   100.5 170.2             7.5
998.0
## 458   251.4               0.0   118.3 192.9             5.8
1043.6
## 459   165.0               0.0   143.6 163.8             0.0
1005.6
## 460   165.0             128.5   132.1 175.1             8.1
1005.8
## 461   178.0             129.8   118.6 179.9             3.6
1007.3
## 462   167.4             129.9   128.6 175.5             7.8
1006.3
## 463   172.4              13.6   172.4 156.8             4.1
1006.3
## 464   173.5              50.1   173.5 164.8             6.5
1006.2
```

```
## 465   167.0               75.4   167.0 164.0              7.9
1007.3
## 466   173.8               93.4   159.9 172.3              9.7
1007.2
## 467   190.3                0.0   125.2 166.6              9.9
1079.0
## 468   250.0                0.0    95.7 191.8              5.3
948.9
## 469   213.5                0.0   174.2 159.2             11.7
1043.6
## 470   194.7                0.0   100.5 170.2              7.5
998.0
## 471   251.4                0.0   118.3 192.9              5.8
1043.6
## 472   446.0               24.0    79.0 162.0             11.6
967.0
## 473   446.0               24.0    79.0 162.0             11.6
967.0
## 474   446.0               24.0    79.0 162.0             11.6
967.0
## 475   446.0               24.0    79.0 162.0             10.3
967.0
## 476   446.0               24.0    79.0 162.0             11.6
967.0
## 477   446.0               24.0    79.0 162.0             11.6
967.0
## 478   446.0               24.0    79.0 162.0             11.6
967.0
## 479   446.0               24.0    79.0 162.0             11.6
967.0
## 480   446.0               24.0    79.0 162.0             11.6
967.0
## 481   446.0               24.0    79.0 162.0             11.6
967.0
## 482   446.0               24.0    79.0 162.0             11.6
967.0
## 483   446.0               24.0    79.0 162.0             11.6
967.0
## 484   446.0               24.0    79.0 162.0             11.6
967.0
## 485   446.0               24.0    79.0 162.0             10.3
967.0
## 486   387.0               20.0    94.0 157.0             14.3
938.0
## 487   387.0               20.0    94.0 157.0             13.9
938.0
## 488   387.0               20.0    94.0 157.0             11.6
938.0
## 489   387.0               20.0    94.0 157.0             14.3
938.0
```

```
## 490   387.0              20.0    94.0 157.0            13.9
938.0
## 491   387.0              20.0    94.0 157.0            11.6
938.0
## 492   387.0              20.0    94.0 157.0            14.3
938.0
## 493   387.0              20.0    94.0 157.0            13.9
938.0
## 494   387.0              20.0    94.0 157.0            11.6
938.0
## 495   387.0              20.0    94.0 157.0            14.3
938.0
## 496   387.0              20.0    94.0 157.0            13.9
938.0
## 497   387.0              20.0    94.0 157.0            11.6
938.0
## 498   355.0              19.0    97.0 145.0            13.1
967.0
## 499   355.0              19.0    97.0 145.0            12.3
967.0
## 500   491.0              26.0   123.0 210.0             3.9
882.0
## 501   491.0              26.0   123.0 201.0             3.9
822.0
## 502   491.0              26.0   123.0 210.0             3.9
882.0
## 503   491.0              26.0   123.0 210.0             3.9
882.0
## 504   491.0              26.0   123.0 210.0             3.9
882.0
## 505   491.0              26.0   123.0 201.0             3.9
822.0
## 506   491.0              26.0   123.0 201.0             3.9
822.0
## 507   491.0              26.0   123.0 201.0             3.9
822.0
## 508   424.0              22.0   132.0 178.0             8.5
822.0
## 509   424.0              22.0   132.0 178.0             8.5
882.0
## 510   424.0              22.0   132.0 168.0             8.9
822.0
## 511   424.0              22.0   132.0 178.0             8.5
822.0
## 512   424.0              22.0   132.0 178.0             8.5
822.0
## 513   424.0              22.0   132.0 168.0             8.9
822.0
## 514   424.0              22.0   132.0 168.0             8.9
822.0
```

```
## 515   424.0               22.0   132.0 168.0               8.9
822.0
## 516   202.0               11.0   141.0 206.0               1.7
942.0
## 517   202.0               11.0   141.0 206.0               1.7
942.0
## 518   202.0               11.0   141.0 206.0               1.7
942.0
## 519   202.0               11.0   141.0 206.0               1.7
942.0
## 520   284.0               15.0   141.0 179.0               5.5
842.0
## 521   284.0               15.0   141.0 179.0               5.5
842.0
## 522   284.0               15.0   141.0 179.0               5.5
842.0
## 523   284.0               15.0   141.0 179.0               5.5
842.0
## 524   359.0               19.0   141.0 154.0              10.9
942.0
## 525   359.0               19.0   141.0 154.0              10.9
942.0
## 526   359.0               19.0   141.0 154.0              10.9
942.0
## 527   359.0               19.0   141.0 154.0              10.9
942.0
## 528   359.0               19.0   141.0 154.0              10.9
942.0
## 529   359.0               19.0   141.0 154.0              10.9
942.0
## 530   359.0               19.0   141.0 154.0              10.9
942.0
## 531   359.0               19.0   141.0 154.0              10.9
942.0
## 532   436.0                0.0     0.0 218.0               0.0
838.4
## 533   289.0                0.0     0.0 192.0               0.0
913.2
## 534   289.0                0.0     0.0 192.0               0.0
913.2
## 535   393.0                0.0     0.0 192.0               0.0
940.6
## 536   393.0                0.0     0.0 192.0               0.0
940.6
## 537   393.0                0.0     0.0 192.0               0.0
940.6
## 538   480.0                0.0     0.0 192.0               0.0
936.2
## 539   480.0                0.0     0.0 192.0               0.0
936.2
```

```
## 540   480.0               0.0     0.0 192.0             0.0
936.2
## 541   480.0               0.0     0.0 192.0             0.0
936.2
## 542   333.0               0.0     0.0 192.0             0.0
931.2
## 543   255.0               0.0     0.0 192.0             0.0
889.8
## 544   255.0               0.0     0.0 192.0             0.0
889.8
## 545   289.0               0.0     0.0 192.0             0.0
913.2
## 546   255.0               0.0     0.0 192.0             0.0
889.8
## 547   333.0               0.0     0.0 192.0             0.0
931.2
## 548   333.0               0.0     0.0 192.0             0.0
931.2
## 549   289.0               0.0     0.0 192.0             0.0
913.2
## 550   333.0               0.0     0.0 192.0             0.0
931.2
## 551   393.0               0.0     0.0 192.0             0.0
940.6
## 552   255.0               0.0     0.0 192.0             0.0
889.8
## 553   158.8             238.2     0.0 185.7             0.0
1040.6
## 555   238.2             158.8     0.0 185.7             0.0
1040.6
## 556   181.9             272.8     0.0 185.7             0.0
1012.4
## 557   193.5             290.2     0.0 185.7             0.0
998.2
## 558   255.5             170.3     0.0 185.7             0.0
1026.6
## 559   272.8             181.9     0.0 185.7             0.0
1012.4
## 561   220.8             147.2     0.0 185.7             0.0
1055.0
## 562   397.0               0.0     0.0 185.7             0.0
1040.6
## 563   382.5               0.0     0.0 185.7             0.0
1047.8
## 564   210.7             316.1     0.0 185.7             0.0
977.0
## 565   158.8             238.2     0.0 185.7             0.0
1040.6
## 566   295.8               0.0     0.0 185.7             0.0
1091.4
```

```
## 567   255.5             170.3     0.0 185.7             0.0
1026.6
## 568   203.5             135.7     0.0 185.7             0.0
1076.2
## 569   397.0               0.0     0.0 185.7             0.0
1040.6
## 570   381.4               0.0     0.0 185.7             0.0
1104.6
## 571   295.8               0.0     0.0 185.7             0.0
1091.4
## 572   228.0             342.1     0.0 185.7             0.0
955.8
## 573   220.8             147.2     0.0 185.7             0.0
1055.0
## 574   316.1             210.7     0.0 185.7             0.0
977.0
## 575   135.7             203.5     0.0 185.7             0.0
1076.2
## 576   238.1               0.0     0.0 185.7             0.0
1118.8
## 577   339.2               0.0     0.0 185.7             0.0
1069.2
## 578   135.7             203.5     0.0 185.7             0.0
1076.2
## 579   193.5             290.2     0.0 185.7             0.0
998.2
## 580   203.5             135.7     0.0 185.7             0.0
1076.2
## 581   290.2             193.5     0.0 185.7             0.0
998.2
## 582   181.9             272.8     0.0 185.7             0.0
1012.4
## 583   170.3             155.5     0.0 185.7             0.0
1026.6
## 584   210.7             316.1     0.0 185.7             0.0
977.0
## 585   228.0             342.1     0.0 185.7             0.0
955.8
## 586   290.2             193.5     0.0 185.7             0.0
998.2
## 587   381.4               0.0     0.0 185.7             0.0
1104.6
## 588   238.2             158.8     0.0 185.7             0.0
1040.6
## 589   186.2             124.1     0.0 185.7             0.0
1083.4
## 590   339.2               0.0     0.0 185.7             0.0
1069.2
## 591   238.1               0.0     0.0 185.7             0.0
1118.8
```

```
## 592   252.5               0.0     0.0 185.7             0.0
1111.6
## 593   382.5               0.0     0.0 185.7             0.0
1047.8
## 594   252.5               0.0     0.0 185.7             0.0
1111.6
## 595   316.1             210.7     0.0 185.7             0.0
977.0
## 596   186.2             124.1     0.0 185.7             0.0
1083.4
## 597   170.3             155.5     0.0 185.7             0.0
1026.6
## 598   272.8             181.9     0.0 185.7             0.0
1012.4
## 599   339.0               0.0     0.0 197.0             0.0
968.0
## 600   339.0               0.0     0.0 197.0             0.0
968.0
## 601   339.0               0.0     0.0 197.0             0.0
968.0
## 602   339.0               0.0     0.0 197.0             0.0
968.0
## 603   339.0               0.0     0.0 197.0             0.0
968.0
## 606   236.0               0.0     0.0 194.0             0.0
968.0
## 607   236.0               0.0     0.0 194.0             0.0
968.0
## 608   236.0               0.0     0.0 194.0             0.0
968.0
## 609   236.0               0.0     0.0 194.0             0.0
968.0
## 612   277.0               0.0     0.0 191.0             0.0
968.0
## 613   277.0               0.0     0.0 191.0             0.0
968.0
## 614   277.0               0.0     0.0 191.0             0.0
968.0
## 615   277.0               0.0     0.0 191.0             0.0
968.0
## 618   254.0               0.0     0.0 198.0             0.0
968.0
## 619   254.0               0.0     0.0 198.0             0.0
968.0
## 624   307.0               0.0     0.0 193.0             0.0
968.0
## 625   307.0               0.0     0.0 193.0             0.0
968.0
## 626   307.0               0.0     0.0 193.0             0.0
968.0
```

```
## 627   236.0               0.0     0.0 193.0             0.0
968.0
## 628   200.0               0.0     0.0 180.0             0.0
1125.0
## 629   200.0               0.0     0.0 180.0             0.0
1125.0
## 630   225.0               0.0     0.0 181.0             0.0
1113.0
## 631   225.0               0.0     0.0 181.0             0.0
1113.0
## 632   325.0               0.0     0.0 184.0             0.0
1063.0
## 633   325.0               0.0     0.0 184.0             0.0
1063.0
## 634   275.0               0.0     0.0 183.0             0.0
1088.0
## 635   275.0               0.0     0.0 183.0             0.0
1088.0
## 636   300.0               0.0     0.0 184.0             0.0
1075.0
## 637   300.0               0.0     0.0 184.0             0.0
1075.0
## 638   375.0               0.0     0.0 186.0             0.0
1038.0
## 639   375.0               0.0     0.0 186.0             0.0
1038.0
## 640   400.0               0.0     0.0 187.0             0.0
1025.0
## 641   400.0               0.0     0.0 187.0             0.0
1025.0
## 642   250.0               0.0     0.0 182.0             0.0
1100.0
## 643   250.0               0.0     0.0 182.0             0.0
1100.0
## 644   350.0               0.0     0.0 186.0             0.0
1050.0
## 645   350.0               0.0     0.0 186.0             0.0
1050.0
## 646   203.5             305.3     0.0 203.5             0.0
963.4
## 647   250.2             166.8     0.0 203.5             0.0
977.6
## 648   157.0             236.0     0.0 192.0             0.0
935.4
## 649   141.3             212.0     0.0 203.5             0.0
971.8
## 650   166.8             250.2     0.0 203.5             0.0
975.6
## 651   122.6             183.9     0.0 203.5             0.0
958.2
```

```
## 652   183.9             122.6     0.0 203.5             0.0
959.2
## 653   102.0             153.0     0.0 192.0             0.0
887.0
## 654   102.0             153.0     0.0 192.0             0.0
887.0
## 655   122.6             183.9     0.0 203.5             0.0
958.2
## 656   166.8             250.2     0.0 203.5             0.0
975.6
## 657   200.0             133.0     0.0 192.0             0.0
965.4
## 658   108.3             162.4     0.0 203.5             0.0
938.2
## 659   305.3             203.5     0.0 203.5             0.0
965.4
## 660   108.3             162.4     0.0 203.5             0.0
938.2
## 661   116.0             173.0     0.0 192.0             0.0
909.8
## 662   141.3             212.0     0.0 203.5             0.0
971.8
## 663   157.0             236.0     0.0 192.0             0.0
935.4
## 664   133.0             200.0     0.0 192.0             0.0
927.4
## 665   250.2             166.8     0.0 203.5             0.0
977.6
## 666   173.0             116.0     0.0 192.0             0.0
946.8
## 667   192.0             288.0     0.0 192.0             0.0
929.8
## 668   192.0             288.0     0.0 192.0             0.0
929.8
## 669   153.0             102.0     0.0 192.0             0.0
888.0
## 670   288.0             192.0     0.0 192.0             0.0
932.0
## 671   305.3             203.5     0.0 203.5             0.0
965.4
## 672   236.0             157.0     0.0 192.0             0.0
972.6
## 673   173.0             116.0     0.0 192.0             0.0
946.8
## 674   212.0             141.3     0.0 203.5             0.0
973.4
## 675   236.0             157.0     0.0 192.0             0.0
972.6
## 676   183.9             122.6     0.0 203.5             0.0
959.2
```

```
## 677   166.8              250.2     0.0 203.5              0.0
975.6
## 678   102.0              153.0     0.0 192.0              0.0
887.0
## 679   288.0              192.0     0.0 192.0              0.0
932.0
## 680   212.0              141.3     0.0 203.5              0.0
973.4
## 681   102.0              153.0     0.0 192.0              0.0
887.0
## 682   173.0              116.0     0.0 192.0              0.0
946.8
## 683   183.9              122.6     0.0 203.5              0.0
959.2
## 684   133.0              200.0     0.0 192.0              0.0
927.4
## 685   192.0              288.0     0.0 192.0              0.0
929.8
## 686   133.0              200.0     0.0 192.0              0.0
927.4
## 687   305.3              203.5     0.0 203.5              0.0
965.4
## 688   236.0              157.0     0.0 192.0              0.0
972.6
## 689   108.3              162.4     0.0 203.5              0.0
938.2
## 690   157.0              236.0     0.0 192.0              0.0
935.4
## 691   288.0              192.0     0.0 192.0              0.0
932.0
## 692   212.0              141.3     0.0 203.5              0.0
973.4
## 693   212.0              141.3     0.0 203.5              0.0
973.4
## 694   153.0              102.0     0.0 192.0              0.0
888.0
## 695   236.0              157.0     0.0 192.0              0.0
972.6
## 696   116.0              173.0     0.0 192.0              0.0
909.8
## 697   183.9              122.6     0.0 203.5              0.0
959.2
## 698   108.3              162.4     0.0 203.5              0.0
938.2
## 699   203.5              305.3     0.0 203.5              0.0
963.4
## 700   203.5              305.3     0.0 203.5              0.0
963.4
## 701   133.0              200.0     0.0 192.0              0.0
927.4
```

```
## 702   288.0              192.0     0.0 192.0              0.0
932.0
## 703   200.0              133.0     0.0 192.0              0.0
965.4
## 704   200.0              133.0     0.0 192.0              0.0
965.4
## 705   250.2              166.8     0.0 203.5              0.0
977.6
## 706   122.6              183.9     0.0 203.5              0.0
958.2
## 707   153.0              102.0     0.0 192.0              0.0
888.0
## 708   200.0              133.0     0.0 192.0              0.0
965.4
## 709   116.0              173.0     0.0 192.0              0.0
909.8
## 710   173.0              116.0     0.0 192.0              0.0
946.8
## 711   250.2              166.8     0.0 203.5              0.0
977.6
## 712   305.3              203.5     0.0 203.5              0.0
965.4
## 713   192.0              288.0     0.0 192.0              0.0
929.8
## 714   157.0              236.0     0.0 192.0              0.0
935.4
## 715   153.0              102.0     0.0 192.0              0.0
888.0
## 716   141.3              212.0     0.0 203.5              0.0
971.8
## 717   116.0              173.0     0.0 192.0              0.0
909.8
## 718   141.3              212.0     0.0 203.5              0.0
971.8
## 719   122.6              183.9     0.0 203.5              0.0
958.2
## 720   166.8              250.2     0.0 203.5              0.0
975.6
## 721   203.5              305.3     0.0 203.5              0.0
963.4
## 722   310.0                0.0     0.0 192.0              0.0
1012.0
## 723   310.0                0.0     0.0 192.0              0.0
1012.0
## 724   310.0                0.0     0.0 192.0              0.0
1012.0
## 725   310.0                0.0     0.0 192.0              0.0
1012.0
## 726   310.0                0.0     0.0 192.0              0.0
1012.0
```

```
## 727   331.0               0.0     0.0 192.0             0.0
1025.0
## 728   331.0               0.0     0.0 192.0             0.0
1025.0
## 729   331.0               0.0     0.0 192.0             0.0
1025.0
## 730   331.0               0.0     0.0 192.0             0.0
1025.0
## 731   331.0               0.0     0.0 192.0             0.0
1025.0
## 732   349.0               0.0     0.0 192.0             0.0
1056.0
## 733   349.0               0.0     0.0 192.0             0.0
1056.0
## 734   349.0               0.0     0.0 192.0             0.0
1056.0
## 735   349.0               0.0     0.0 192.0             0.0
1056.0
## 736   349.0               0.0     0.0 192.0             0.0
1056.0
## 737   238.0               0.0     0.0 186.0             0.0
1119.0
## 738   238.0               0.0     0.0 186.0             0.0
1119.0
## 739   296.0               0.0     0.0 186.0             0.0
1090.0
## 740   296.0               0.0     0.0 186.0             0.0
1090.0
## 741   297.0               0.0     0.0 186.0             0.0
1040.0
## 742   480.0               0.0     0.0 192.0             0.0
936.0
## 743   480.0               0.0     0.0 192.0             0.0
936.0
## 744   397.0               0.0     0.0 186.0             0.0
1040.0
## 745   281.0               0.0     0.0 186.0             0.0
1104.0
## 746   281.0               0.0     0.0 185.0             0.0
1104.0
## 747   500.0               0.0     0.0 200.0             0.0
1125.0
## 748   500.0               0.0     0.0 200.0             0.0
1125.0
## 749   500.0               0.0     0.0 200.0             0.0
1125.0
## 750   500.0               0.0     0.0 200.0             0.0
1125.0
## 751   500.0               0.0     0.0 200.0             0.0
1125.0
```

```
## 752   540.0               0.0     0.0 173.0             0.0
1125.0
## 753   540.0               0.0     0.0 173.0             0.0
1125.0
## 754   540.0               0.0     0.0 173.0             0.0
1125.0
## 755   540.0               0.0     0.0 173.0             0.0
1125.0
## 758   350.0               0.0     0.0 203.0             0.0
974.0
## 759   350.0               0.0     0.0 203.0             0.0
974.0
## 760   350.0               0.0     0.0 203.0             0.0
974.0
## 761   350.0               0.0     0.0 203.0             0.0
974.0
## 762   350.0               0.0     0.0 203.0             0.0
974.0
## 764   385.0               0.0     0.0 186.0             0.0
966.0
## 765   385.0               0.0     0.0 186.0             0.0
966.0
## 766   385.0               0.0     0.0 186.0             0.0
966.0
## 767   385.0               0.0     0.0 186.0             0.0
966.0
## 768   385.0               0.0     0.0 186.0             0.0
966.0
## 771   349.0               0.0     0.0 192.0             0.0
1047.0
## 772   331.0               0.0     0.0 192.0             0.0
978.0
## 773   382.0               0.0     0.0 186.0             0.0
1047.0
## 774   382.0               0.0     0.0 186.0             0.0
1047.0
## 775   382.0               0.0     0.0 186.0             0.0
1111.0
## 776   281.0               0.0     0.0 186.0             0.0
1104.0
## 777   339.0               0.0     0.0 185.0             0.0
1069.0
## 778   339.0               0.0     0.0 185.0             0.0
1069.0
## 779   295.0               0.0     0.0 185.0             0.0
1069.0
## 780   295.0               0.0     0.0 185.0             0.0
1069.0
## 781   238.0               0.0     0.0 185.0             0.0
1118.0
```

```
## 782   296.0               0.0     0.0 192.0             0.0
1085.0
## 783   296.0               0.0     0.0 192.0             0.0
1085.0
## 784   296.0               0.0     0.0 192.0             0.0
1085.0
## 785   331.0               0.0     0.0 192.0             0.0
879.0
## 786   331.0               0.0     0.0 192.0             0.0
978.0
## 787   331.0               0.0     0.0 192.0             0.0
978.0
## 788   331.0               0.0     0.0 192.0             0.0
978.0
## 789   349.0               0.0     0.0 192.0             0.0
1047.0
## 790   349.0               0.0     0.0 192.0             0.0
1047.0
## 791   349.0               0.0     0.0 192.0             0.0
1047.0
## 794   302.0               0.0     0.0 203.0             0.0
974.0
## 797   500.0               0.0     0.0 200.0             0.0
1125.0
## 800   540.0               0.0     0.0 173.0             0.0
1125.0
## 801   252.0               0.0     0.0 185.0             0.0
1111.0
## 802   252.0               0.0     0.0 185.0             0.0
1111.0
## 803   339.0               0.0     0.0 185.0             0.0
1060.0
## 804   393.0               0.0     0.0 192.0             0.0
940.0
## 805   393.0               0.0     0.0 192.0             0.0
940.0
## 806   393.0               0.0     0.0 192.0             0.0
940.0
## 807   382.0               0.0     0.0 185.0             0.0
1047.0
## 808   382.0               0.0     0.0 185.0             0.0
1047.0
## 809   252.0               0.0     0.0 186.0             0.0
1111.0
## 810   252.0               0.0     0.0 185.0             0.0
1111.0
## 811   310.0               0.0     0.0 192.0             0.0
970.0
## 812   310.0               0.0     0.0 192.0             0.0
970.0
```

```
## 813   310.0               0.0     0.0 192.0              0.0
970.0
## 816   525.0               0.0     0.0 189.0              0.0
1125.0
## 817   525.0               0.0     0.0 189.0              0.0
1125.0
## 818   525.0               0.0     0.0 189.0              0.0
1125.0
## 819   525.0               0.0     0.0 189.0              0.0
1125.0
## 820   525.0               0.0     0.0 189.0              0.0
1125.0
## 822   322.0               0.0     0.0 203.0              0.0
974.0
## 823   322.0               0.0     0.0 203.0              0.0
974.0
## 825   302.0               0.0     0.0 203.0              0.0
974.0
## 826   397.0               0.0     0.0 185.0              0.0
1040.0
## 827   480.0               0.0     0.0 192.0              0.0
936.0
## 828   522.0               0.0     0.0 146.0              0.0
896.0
## 829   522.0               0.0     0.0 146.0              0.0
896.0
## 830   273.0             105.0    82.0 210.0              9.0
904.0
## 831   162.0             190.0   148.0 179.0             19.0
838.0
## 832   154.0             144.0   112.0 220.0             10.0
923.0
## 833   147.0             115.0    89.0 202.0              9.0
860.0
## 834   152.0             178.0   139.0 168.0             18.0
944.0
## 835   310.0             143.0   111.0 168.0             22.0
914.0
## 836   144.0               0.0   175.0 158.0             18.0
943.0
## 837   304.0             140.0     0.0 214.0              6.0
895.0
## 838   374.0               0.0     0.0 190.0              7.0
1013.0
## 839   159.0             149.0   116.0 175.0             15.0
953.0
## 840   153.0             239.0     0.0 200.0              6.0
1002.0
## 841   310.0             143.0     0.0 168.0             10.0
914.0
```

```
## 842   305.0                0.0   100.0 196.0             10.0
959.0
## 843   151.0                0.0   184.0 167.0             12.0
991.0
## 844   142.0              167.0   130.0 174.0             11.0
883.0
## 845   298.0              137.0   107.0 201.0              6.0
878.0
## 846   321.0              164.0     0.0 190.0              5.0
870.0
## 847   366.0              187.0     0.0 191.0              7.0
824.0
## 848   280.0              129.0   100.0 172.0              9.0
825.0
## 849   252.0               97.0    76.0 194.0              8.0
835.0
## 850   165.0                0.0   150.0 182.0             12.0
1023.0
## 851   156.0              243.0     0.0 180.0             11.0
1022.0
## 852   160.0              188.0   146.0 203.0             11.0
829.0
## 853   298.0                0.0   107.0 186.0              6.0
879.0
## 854   318.0                0.0   126.0 210.0              6.0
861.0
## 855   287.0              121.0    94.0 188.0              9.0
904.0
## 856   326.0              166.0     0.0 174.0              9.0
882.0
## 857   356.0                0.0   142.0 193.0             11.0
801.0
## 858   132.0              207.0   161.0 179.0              5.0
867.0
## 859   322.0              149.0     0.0 186.0              8.0
951.0
## 860   164.0                0.0   200.0 181.0             13.0
849.0
## 861   314.0                0.0   113.0 170.0             10.0
925.0
## 862   321.0                0.0   128.0 182.0             11.0
870.0
## 864   288.0              121.0     0.0 177.0              7.0
908.0
## 865   298.0                0.0   107.0 210.0             11.0
880.0
## 866   265.0              111.0    86.0 195.0              6.0
833.0
## 867   160.0              250.0     0.0 168.0             12.0
1049.0
```

```
## 868   166.0              260.0     0.0 183.0             13.0
859.0
## 869   276.0              116.0    90.0 180.0              9.0
870.0
## 870   322.0                0.0   116.0 196.0             10.0
818.0
## 871   149.0              139.0   109.0 193.0              6.0
892.0
## 872   159.0              187.0     0.0 176.0             11.0
990.0
## 873   261.0              100.0    78.0 201.0              9.0
864.0
## 875   313.0                0.0   113.0 178.0              8.0
1002.0
## 876   155.0              183.0     0.0 193.0              9.0
1047.0
## 877   146.0              230.0     0.0 202.0              3.0
827.0
## 878   296.0                0.0   107.0 221.0             11.0
819.0
## 879   133.0              210.0     0.0 196.0              3.0
949.0
## 880   313.0              145.0     0.0 178.0              8.0
867.0
## 881   152.0                0.0   112.0 184.0              8.0
992.0
## 882   153.0              145.0   113.0 178.0              8.0
1002.0
## 883   140.0              133.0   103.0 200.0              7.0
916.0
## 884   149.0              236.0     0.0 176.0             13.0
847.0
## 885   300.0                0.0   120.0 212.0             10.0
878.0
## 886   153.0              145.0   113.0 178.0              8.0
867.0
## 887   148.0                0.0   137.0 158.0             16.0
1002.0
## 888   326.0                0.0   138.0 199.0             11.0
801.0
## 889   153.0              145.0     0.0 178.0              8.0
1000.0
## 890   262.0              111.0    86.0 195.0              5.0
895.0
## 891   158.0                0.0   195.0 220.0             11.0
898.0
## 892   151.0                0.0   185.0 167.0             16.0
1074.0
## 893   273.0                0.0    90.0 199.0             11.0
931.0
```

```
## 894   149.0              118.0    92.0 183.0              7.0
953.0
## 895   143.0              169.0   143.0 191.0              8.0
967.0
## 896   260.0              101.0    78.0 171.0             10.0
936.0
## 897   313.0              161.0     0.0 178.0             10.0
917.0
## 898   284.0              120.0     0.0 168.0              7.0
970.0
## 899   336.0                0.0     0.0 182.0              3.0
986.0
## 900   145.0                0.0   134.0 181.0             11.0
979.0
## 901   150.0              237.0     0.0 174.0             12.0
1069.0
## 902   144.0              170.0   133.0 192.0              8.0
814.0
## 903   331.0              170.0     0.0 195.0              8.0
811.0
## 904   155.0                0.0   143.0 193.0              9.0
1047.0
## 905   155.0              183.0     0.0 193.0              9.0
877.0
## 906   135.0                0.0   166.0 180.0             10.0
961.0
## 907   266.0              112.0    87.0 178.0             10.0
910.0
## 908   314.0              145.0   113.0 179.0              8.0
869.0
## 909   313.0              145.0     0.0 127.0              8.0
1000.0
## 910   146.0              173.0     0.0 182.0              3.0
986.0
## 911   144.0              136.0   106.0 178.0              7.0
941.0
## 912   148.0                0.0   182.0 181.0             15.0
839.0
## 913   277.0              117.0    91.0 191.0              7.0
946.0
## 914   298.0                0.0   107.0 164.0             13.0
953.0
## 915   313.0              145.0     0.0 178.0              8.0
1002.0
## 916   155.0              184.0   143.0 194.0              9.0
880.0
## 917   289.0              134.0     0.0 195.0              6.0
924.0
## 918   148.0              175.0     0.0 171.0              2.0
1000.0
```

```
## 919   145.0               0.0   179.0 202.0              8.0
824.0
## 920   313.0               0.0     0.0 178.0              8.0
1000.0
## 921   136.0             162.0   126.0 172.0             10.0
923.0
## 922   155.0               0.0   143.0 193.0              9.0
877.0
## 923   255.0              99.0    77.0 189.0              6.0
919.0
## 924   162.0             207.0   172.0 216.0             10.0
822.0
## 925   136.0             196.0    98.0 199.0              6.0
847.0
## 926   164.0             163.0   128.0 197.0              8.0
961.0
## 927   162.0             214.0   164.0 202.0             10.0
820.0
## 928   157.0             214.0   152.0 200.0              9.0
819.0
## 929   149.0             153.0   194.0 192.0              8.0
935.0
## 930   135.0             105.0   193.0 196.0              6.0
965.0
## 931   159.0             209.0   161.0 201.0              7.0
848.0
## 932   144.0              15.0   195.0 176.0              6.0
1021.0
## 933   154.0             174.0   185.0 228.0              7.0
845.0
## 934   167.0             187.0   195.0 185.0              7.0
898.0
## 935   184.0              86.0   190.0 213.0              6.0
923.0
## 936   156.0             178.0   187.0 221.0              7.0
854.0
## 938   313.3               0.0   113.0 178.5              8.0
1001.9
## 939   154.8             183.4     0.0 193.3              9.1
1047.4
## 940   145.9             230.5     0.0 202.5              3.4
827.0
## 941   296.0               0.0   106.7 221.4             10.5
819.2
## 942   133.1             210.2     0.0 195.7              3.1
949.4
## 943   313.3             145.0     0.0 178.5              8.0
867.2
## 944   151.6               0.0   111.9 184.4              7.9
992.0
```

```
## 945   153.1              145.0   113.0 178.5              8.0
1001.9
## 946   139.9              132.6   103.3 200.3              7.4
916.0
## 947   149.5              236.0     0.0 175.8             12.6
846.8
## 948   299.8                0.0   119.8 211.5              9.9
878.2
## 949   153.1              145.0   113.0 178.5              8.0
867.2
## 950   148.1                0.0   136.6 158.1             16.1
1001.8
## 951   326.5                0.0   137.9 199.0             10.8
801.1
## 952   152.7              144.7     0.0 178.1              8.0
999.7
## 953   261.9              110.5    86.1 195.4              5.0
895.2
## 954   158.4                0.0   194.9 219.7             11.0
897.7
## 955   150.7                0.0   185.3 166.7             15.6
1074.5
## 956   272.6                0.0    89.6 198.7             10.6
931.3
## 957   149.0              117.6    91.7 182.9              7.1
953.4
## 958   143.0              169.4   142.7 190.7              8.4
967.4
## 959   259.9              100.6    78.4 170.6             10.4
935.7
## 960   312.9              160.5     0.0 177.6              9.6
916.6
## 961   284.0              119.7     0.0 168.3              7.2
970.4
## 962   336.5                0.0     0.0 181.9              3.4
985.8
## 963   144.8                0.0   133.6 180.8             11.1
979.5
## 964   150.0              236.8     0.0 173.8             11.9
1069.3
## 965   143.7              170.2   132.6 191.6              8.5
814.1
## 966   330.5              169.6     0.0 194.9              8.1
811.0
## 967   154.8                0.0   142.8 193.3              9.1
1047.4
## 968   154.8              183.4     0.0 193.3              9.1
877.2
## 969   134.7                0.0   165.7 180.2             10.0
961.0
```

```
## 970   266.2             112.3    87.5 177.9             10.4
909.7
## 971   314.0             145.3   113.2 178.9              8.0
869.1
## 972   312.7             144.7     0.0 127.3              8.0
999.7
## 973   145.7             172.6     0.0 181.9              3.4
985.8
## 974   143.8             136.3   106.2 178.1              7.5
941.5
## 975   148.1               0.0   182.1 181.4             15.0
838.9
## 976   277.0             116.8    91.0 190.6              7.0
946.5
## 977   298.1               0.0   107.5 163.6             12.8
953.2
## 978   313.3             145.0     0.0 178.5              8.0
1001.9
## 979   155.2             183.9   143.2 193.8              9.2
879.6
## 980   289.0             133.7     0.0 194.9              5.5
924.1
## 981   147.8             175.1     0.0 171.2              2.2
1000.0
## 982   145.4               0.0   178.9 201.7              7.8
824.0
## 983   312.7               0.0     0.0 178.1              8.0
999.7
## 984   136.4             161.6   125.8 171.6             10.4
922.6
## 985   154.8               0.0   142.8 193.3              9.1
877.2
## 986   255.3              98.8    77.0 188.6              6.5
919.0
## 987   272.8             105.1    81.8 209.7              9.0
904.0
## 988   162.0             190.1   148.1 178.8             18.8
838.1
## 989   153.6             144.2   112.3 220.1             10.1
923.2
## 990   146.5             114.6    89.3 201.9              8.8
860.0
## 991   151.8             178.1   138.7 167.5             18.3
944.0
## 992   309.9             142.8   111.2 167.8             22.1
913.9
## 993   143.6               0.0   174.9 158.4             17.9
942.7
## 994   303.6             139.9     0.0 213.5              6.2
895.5
```

```
## 995   374.3               0.0     0.0 190.2              6.7
1013.2
## 996   158.6             148.9   116.0 175.1             15.0
953.3
## 997   152.6             238.7     0.0 200.0              6.3
1001.8
## 998   310.0             142.8     0.0 167.9             10.0
914.3
## 999   304.8               0.0    99.6 196.0              9.8
959.4
## 1000  150.9               0.0   183.9 166.6             11.6
991.2
## 1001  141.9             166.6   129.7 173.5             10.9
882.6
## 1002  297.8             137.2   106.9 201.3              6.0
878.4
## 1003  321.3             164.2     0.0 190.5              4.6
870.0
## 1004  366.0             187.0     0.0 191.3              6.6
824.3
## 1005  279.8             128.9   100.4 172.4              9.5
825.1
## 1006  252.1              97.1    75.6 193.8              8.3
835.5
## 1007  164.6               0.0   150.4 181.6             11.7
1023.3
## 1008  155.6             243.5     0.0 180.3             10.7
1022.0
## 1009  160.2             188.0   146.4 203.2             11.3
828.7
## 1010  298.1               0.0   107.0 186.4              6.1
879.0
## 1011  317.9               0.0   126.5 209.7              5.7
860.5
## 1012  287.3             120.5    93.9 187.6              9.2
904.4
## 1013  325.6             166.4     0.0 174.0              8.9
881.6
## 1014  355.9               0.0   141.6 193.3             11.0
801.4
## 1015  132.0             206.5   160.9 178.9              5.5
866.9
## 1016  322.5             148.6     0.0 185.8              8.5
951.0
## 1017  164.2               0.0   200.1 181.2             12.6
849.3
## 1018  313.8               0.0   112.6 169.9             10.1
925.3
## 1019  321.4               0.0   127.9 182.5             11.5
870.1
```

```
## 1021  288.4              121.0     0.0 177.4              7.0
907.9
## 1022  298.2                0.0   107.0 209.7             11.1
879.6
## 1023  264.5              111.0    86.5 195.5              5.9
832.6
## 1024  159.8              250.0     0.0 168.4             12.2
1049.3
## 1025  166.0              259.7     0.0 183.2             12.7
858.8
## 1026  276.4              116.0    90.3 179.6              8.9
870.1
## 1027  322.2                0.0   115.6 196.0             10.4
817.9
## 1028  148.5              139.4   108.6 192.7              6.1
892.4
## 1029  159.1              186.7     0.0 175.6             11.3
989.6
## 1030  260.9              100.5    78.3 200.6              8.6
864.5
##      Fine_Aggregate Age_day Concrete_compressive_strength
## 2             676.0      28                         61.89
## 6             670.0      90                         47.03
## 9             670.0      28                         45.85
## 11            825.5      90                         38.07
## 12            825.5      28                         28.02
## 14            670.0      90                         42.33
## 15            670.0      28                         47.81
## 16            670.0      90                         52.91
## 17            806.9      90                         39.36
## 22            806.9      28                         28.24
## 23            806.9       3                          8.06
## 41            670.0      90                         50.46
## 47            806.9       3                         15.05
## 54            670.0      90                         49.19
## 55            806.9       7                         14.59
## 56            825.5       7                         14.64
## 58            825.5       3                          9.13
## 63            850.6       3                          9.87
## 69            670.0      28                         40.86
## 70            800.0      28                         71.99
## 71            756.7       3                         34.40
## 72            611.8       3                         28.80
## 73            887.1       3                         33.40
## 74            803.7       3                         36.30
## 76            781.5       3                         37.80
## 78            887.1       3                         33.40
## 79            925.7       3                         28.10
## 81            887.1       3                         33.40
## 82            880.4       3                         25.20
```

```
## 83            852.1       3                    41.10
## 84            755.8       3                    35.30
## 85            659.9       3                    28.30
## 86            605.0       3                    28.60
## 87            755.8       3                    35.30
## 88            803.7       3                    24.40
## 89            755.8       3                    35.30
## 90            707.9       3                    39.30
## 91            755.8       3                    40.60
## 92            755.8       3                    35.30
## 93            755.8       3                    24.10
## 94            756.7       7                    46.20
## 95            611.8       7                    42.80
## 96            887.1       7                    49.20
## 97            803.7       7                    46.80
## 99            781.5       7                    55.60
## 101           887.1       7                    49.20
## 102           925.7       7                    34.90
## 104           887.1       7                    49.20
## 105           880.4       7                    33.40
## 106           852.1       7                    54.10
## 107           755.8       7                    55.90
## 108           659.9       7                    49.80
## 109           605.0       7                    47.10
## 110           755.8       7                    55.90
## 111           803.7       7                    38.00
## 112           755.8       7                    55.90
## 113           707.9       7                    56.10
## 114           755.8       7                    59.09
## 115           755.8       7                    22.90
## 116           755.8       7                    35.10
## 117           756.7      28                    61.09
## 118           611.8      28                    59.80
## 119           887.1      28                    60.29
## 120           803.7      28                    61.80
## 122           781.5      28                    68.30
## 124           887.1      28                    60.29
## 125           925.7      28                    50.70
## 127           887.1      28                    60.29
## 128           880.4      28                    55.50
## 129           852.1      28                    68.50
## 130           755.8      28                    71.30
## 131           659.9      28                    74.70
## 132           605.0      28                    52.20
## 133           755.8      28                    71.30
## 134           803.7      28                    67.70
## 135           755.8      28                    71.30
## 136           707.9      28                    66.00
## 137           755.8      28                    74.50
## 138           755.8      28                    71.30
```

```
## 139          755.8      28                    49.90
## 140          756.7      56                    63.40
## 141          611.8      56                    64.90
## 142          887.1      56                    64.30
## 143          803.7      56                    64.90
## 145          781.5      56                    72.30
## 147          887.1      56                    64.30
## 148          925.7      56                    55.20
## 150          887.1      56                    64.30
## 151          880.4      56                    66.10
## 152          852.1      56                    73.70
## 153          755.8      56                    77.30
## 155          605.0      56                    54.90
## 156          755.8      56                    77.30
## 157          803.7      56                    72.99
## 158          755.8      56                    77.30
## 159          707.9      56                    71.70
## 160          755.8      56                    79.40
## 161          755.8      56                    77.30
## 162          755.8      56                    59.89
## 163          756.7      91                    64.90
## 164          611.8      91                    66.60
## 165          887.1      91                    65.20
## 166          803.7      91                    66.70
## 168          781.5      91                    74.19
## 170          887.1      91                    65.20
## 171          925.7      91                    57.60
## 173          887.1      91                    65.20
## 174          880.4      91                    68.10
## 175          852.1      91                    75.50
## 176          755.8      91                    79.30
## 177          605.0      91                    56.50
## 178          755.8      91                    79.30
## 179          803.7      91                    76.80
## 180          755.8      91                    79.30
## 181          707.9      91                    73.30
## 183          755.8      91                    79.30
## 184          755.8      91                    67.80
## 185          870.3       3                    11.58
## 186          870.3      14                    24.45
## 187          870.3      28                    24.89
## 188          870.3      56                    29.45
## 189          870.3     100                    40.71
## 190          852.2       3                    10.38
## 191          852.2      14                    22.14
## 192          852.2      28                    22.84
## 193          852.2      56                    27.66
## 194          852.2     100                    34.56
## 195          905.9       3                    12.45
## 196          905.9      14                    24.99
```

```
## 197          905.9      28                    25.72
## 198          905.9      56                    33.96
## 199          905.9     100                    37.34
## 200          804.0       3                    15.04
## 201          804.0      14                    21.06
## 202          804.0      28                    26.40
## 203          804.0      56                    35.34
## 204          804.0     100                    40.57
## 205          779.3       3                    12.47
## 206          779.3      14                    20.92
## 207          779.3      28                    24.90
## 208          779.3      56                    34.20
## 209          779.3     100                    39.61
## 210          758.6       3                    10.03
## 211          758.6      14                    20.08
## 212          758.6      28                    24.48
## 213          758.6      56                    31.54
## 214          758.6     100                    35.34
## 215          802.6       3                     9.45
## 216          802.6      14                    22.72
## 217          802.6      28                    28.47
## 218          802.6      56                    38.56
## 219          802.6     100                    40.39
## 220          780.1       3                    10.76
## 221          780.1      14                    25.48
## 222          780.1      28                    21.54
## 223          780.1      56                    28.63
## 224          780.1     100                    33.54
## 230          785.4       3                    18.00
## 231          785.4      14                    30.39
## 232          785.4      28                    45.71
## 233          785.4      56                    50.77
## 234          785.4     100                    53.90
## 235          785.5       3                    13.18
## 236          785.5      14                    17.84
## 237          785.5      28                    40.23
## 238          785.5      56                    47.13
## 239          785.5     100                    49.97
## 240          757.6       3                    13.36
## 241          757.6      14                    22.32
## 242          757.6      28                    24.54
## 243          757.6      56                    31.35
## 244          757.6     100                    40.86
## 245          847.0       3                    19.93
## 246          847.0      14                    25.69
## 247          847.0      28                    30.23
## 248          847.0      56                    39.59
## 249          847.0     100                    44.30
## 250          861.2       3                    13.82
## 251          861.2      14                    24.92
```

```
## 252          861.2      28                    29.22
## 253          861.2      56                    38.33
## 254          861.2     100                    42.35
## 255          903.6       3                    13.54
## 256          903.6      14                    26.31
## 257          903.6      28                    31.64
## 258          903.6      56                    42.55
## 259          903.6     100                    42.92
## 260          903.8       3                    13.33
## 261          903.8      14                    25.37
## 262          903.8      28                    37.40
## 263          903.8      56                    44.40
## 264          903.8     100                    47.74
## 265          799.5       3                    19.52
## 266          799.5      14                    31.35
## 267          799.5      28                    38.50
## 268          799.5      56                    45.08
## 269          799.5     100                    47.82
## 270          778.5       3                    15.44
## 271          778.5      14                    26.77
## 272          778.5      28                    33.73
## 273          778.5      56                    42.70
## 274          778.5     100                    45.84
## 275          757.7       3                    17.22
## 276          757.7      14                    29.93
## 277          757.7      28                    29.65
## 278          757.7      56                    36.97
## 279          757.7     100                    43.58
## 280          757.7       3                    13.12
## 281          757.7      14                    24.43
## 282          757.7      28                    32.66
## 283          757.7      56                    36.64
## 284          757.7     100                    44.21
## 285          777.8       3                    13.62
## 286          777.8      14                    21.60
## 287          777.8      28                    27.77
## 288          777.8      56                    35.57
## 289          777.8     100                    45.37
## 290          780.7       3                     7.32
## 291          780.7      14                    21.50
## 292          780.7      28                    31.27
## 293          780.7      56                    43.50
## 294          780.7     100                    48.67
## 295          796.2       3                     7.40
## 296          796.2      14                    23.51
## 297          796.2      28                    31.12
## 298          796.2      56                    39.15
## 299          796.2     100                    48.15
## 300          865.0       3                    22.50
## 301          865.0      14                    34.67
```

```
## 302          865.0      28                    34.74
## 303          865.0      56                    45.08
## 304          865.0     100                    48.97
## 305          875.6       3                    23.14
## 306          875.6      14                    41.89
## 307          875.6      28                    48.28
## 308          875.6      56                    51.04
## 309          875.6     100                    55.64
## 310          859.2       3                    22.95
## 311          859.2      14                    35.23
## 312          859.2      28                    39.94
## 313          859.2      56                    48.72
## 314          859.2     100                    52.04
## 315          899.8       3                    21.02
## 316          899.8      14                    33.36
## 317          899.8      28                    33.94
## 318          899.8      56                    44.14
## 319          899.8     100                    45.37
## 320          889.0       3                    15.36
## 321          889.0      14                    28.68
## 322          889.0      28                    30.85
## 323          889.0      56                    42.03
## 324          889.0     100                    51.06
## 325          889.0       3                    21.78
## 326          889.0      14                    42.29
## 327          889.0      28                    50.60
## 328          889.0      56                    55.83
## 329          889.0     100                    60.95
## 330          800.9       3                    23.52
## 331          800.9      14                    42.22
## 332          800.9      28                    52.50
## 333          800.9      56                    60.32
## 334          800.9     100                    66.42
## 335          777.5       3                    23.80
## 336          777.5      14                    38.77
## 337          777.5      28                    51.33
## 338          777.5      56                    56.85
## 339          777.5     100                    58.61
## 340          753.5       3                    21.91
## 341          753.5      14                    36.99
## 342          753.5      28                    47.40
## 343          753.5      56                    51.96
## 344          753.5     100                    56.74
## 345          776.4       3                    17.57
## 346          776.4      14                    33.73
## 347          776.4      28                    40.15
## 348          776.4      56                    46.64
## 349          776.4     100                    50.08
## 350          775.5       3                    17.37
## 351          775.5      14                    33.70
```

```
## 352          775.5      28                    45.94
## 353          775.5      56                    51.43
## 354          775.5     100                    59.30
## 355          782.5       3                    30.45
## 356          782.5      14                    47.71
## 357          782.5      28                    63.14
## 358          782.5      56                    66.82
## 359          782.5     100                    66.95
## 360          792.7       3                    27.42
## 361          792.7      14                    35.96
## 362          792.7      28                    55.51
## 363          792.7      56                    61.99
## 364          792.7     100                    63.53
## 365          780.6       3                    18.02
## 366          780.6      14                    38.60
## 367          780.6      28                    52.20
## 368          780.6      56                    53.96
## 369          780.6     100                    56.63
## 370          794.9       3                    15.34
## 371          794.9      14                    26.05
## 372          794.9      28                    30.22
## 373          794.9      56                    37.27
## 374          794.9     100                    46.23
## 375          762.4       3                    16.28
## 376          762.4      14                    25.62
## 377          762.4      28                    31.97
## 378          762.4      56                    36.30
## 379          762.4     100                    43.06
## 380          853.0      28                    67.57
## 381          641.0      28                    57.23
## 383          630.0      28                    64.02
## 384          745.0      28                    78.80
## 385          802.0      28                    41.37
## 386          855.0      28                    60.28
## 387          720.0      28                    56.83
## 388          805.0      28                    51.02
## 389          768.0      28                    55.55
## 390          613.2      28                    44.13
## 391          613.2      28                    39.38
## 392          633.0      28                    55.65
## 393          652.0      28                    47.28
## 394          633.0      28                    44.33
## 395          695.0      28                    52.30
## 396          660.0      28                    49.25
## 397          802.0      28                    41.37
## 398          880.0      28                    29.16
## 399          879.0      28                    39.40
## 400          760.0      28                    39.30
## 401          800.0      28                    67.87
## 402          662.0      28                    58.52
```

```
## 403          685.0     28                    53.58
## 404          657.0     28                    59.00
## 405          765.0     28                    76.24
## 406          655.0     28                    69.84
## 407          900.9      3                    14.40
## 408          746.6      3                    19.42
## 409          746.8      3                    20.73
## 410          746.6      3                    14.94
## 411          856.4      3                    21.29
## 412          793.5      3                    23.08
## 413          770.1      3                    15.52
## 414          746.6      3                    15.82
## 415          798.9      3                    12.55
## 416          857.2      3                     8.49
## 417          771.9      3                    15.61
## 418          901.8      3                    12.18
## 419          754.3      3                    11.98
## 420          900.9     14                    16.88
## 421          746.6     14                    33.09
## 422          746.8     14                    34.24
## 423          746.6     14                    31.81
## 424          856.4     14                    29.75
## 425          793.5     14                    33.01
## 426          770.1     14                    32.90
## 427          746.6     14                    29.55
## 428          798.9     14                    19.42
## 429          857.2     14                    24.66
## 430          771.9     14                    29.59
## 431          901.8     14                    24.28
## 432          754.3     14                    20.73
## 433          900.9     28                    26.20
## 434          746.6     28                    46.39
## 435          746.8     28                    39.16
## 436          746.6     28                    41.20
## 437          856.4     28                    33.69
## 438          793.5     28                    38.20
## 439          770.1     28                    41.41
## 440          746.6     28                    37.81
## 441          798.9     28                    24.85
## 442          857.2     28                    27.22
## 443          771.9     28                    44.64
## 444          901.8     28                    37.27
## 445          754.3     28                    33.27
## 446          900.9     56                    36.56
## 447          746.6     56                    53.72
## 448          746.8     56                    48.59
## 449          746.6     56                    51.72
## 450          856.4     56                    35.85
## 451          793.5     56                    53.77
## 452          770.1     56                    53.46
```

```
## 453          746.6      56                    48.99
## 454          798.9      56                    31.72
## 455          857.2      56                    39.64
## 456          771.9      56                    51.26
## 457          901.8      56                    43.39
## 458          754.3      56                    39.27
## 459          900.9     100                    37.96
## 460          746.6     100                    55.02
## 461          746.8     100                    49.99
## 462          746.6     100                    53.66
## 463          856.4     100                    37.68
## 464          793.5     100                    56.06
## 465          770.1     100                    56.81
## 466          746.6     100                    50.94
## 467          798.9     100                    33.56
## 468          857.2     100                    41.16
## 469          771.9     100                    52.96
## 470          901.8     100                    44.28
## 471          754.3     100                    40.15
## 472          712.0      28                    57.03
## 473          712.0      28                    44.42
## 474          712.0      28                    51.02
## 475          712.0      28                    53.39
## 476          712.0       3                    35.36
## 477          712.0       3                    25.02
## 478          712.0       3                    23.35
## 479          712.0       7                    52.01
## 480          712.0       7                    38.02
## 481          712.0       7                    39.30
## 482          712.0      56                    61.07
## 483          712.0      56                    56.14
## 484          712.0      56                    55.25
## 485          712.0      56                    54.77
## 486          845.0      28                    50.24
## 487          845.0      28                    46.68
## 488          845.0      28                    46.68
## 489          845.0       3                    22.75
## 490          845.0       3                    25.51
## 491          845.0       3                    34.77
## 492          845.0       7                    36.84
## 493          845.0       7                    45.90
## 494          845.0       7                    41.67
## 495          845.0      56                    56.34
## 496          845.0      56                    47.97
## 497          845.0      56                    61.46
## 498          871.0      28                    44.03
## 499          871.0      28                    55.45
## 500          699.0      28                    55.55
## 501          699.0      28                    57.92
## 502          699.0       3                    25.61
```

```
## 503          699.0       7                    33.49
## 504          699.0      56                    59.59
## 505          699.0       3                    29.55
## 506          699.0       7                    37.92
## 507          699.0      56                    61.86
## 508          750.0      28                    62.05
## 509          750.0       3                    32.01
## 510          750.0      28                    72.10
## 511          750.0       7                    39.00
## 512          750.0      56                    65.70
## 513          750.0       3                    32.11
## 514          750.0       7                    40.29
## 515          750.0      56                    74.36
## 516          801.0      28                    21.97
## 517          801.0       3                     9.85
## 518          801.0       7                    15.07
## 519          801.0      56                    23.25
## 520          801.0      28                    43.73
## 521          801.0       3                    13.40
## 522          801.0       7                    24.13
## 523          801.0      56                    44.52
## 524          801.0      28                    62.94
## 525          801.0      28                    59.49
## 526          801.0       3                    25.12
## 527          801.0       3                    23.64
## 528          801.0       7                    35.75
## 529          801.0       7                    38.61
## 530          801.0      56                    68.75
## 531          801.0      56                    66.78
## 532          719.7      28                    23.85
## 533          895.3      90                    32.07
## 534          895.3       3                    11.65
## 535          785.6       3                    19.20
## 536          785.6      90                    48.85
## 537          785.6      28                    39.60
## 538          712.2      28                    43.94
## 539          712.2       7                    34.57
## 540          712.2      90                    54.32
## 541          712.2       3                    24.40
## 542          842.6       3                    15.62
## 543          945.0      90                    21.86
## 544          945.0       7                    10.22
## 545          895.3       7                    14.60
## 546          945.0      28                    18.75
## 547          842.6      28                    31.97
## 548          842.6       7                    23.40
## 549          895.3      28                    25.57
## 550          842.6      90                    41.68
## 551          785.6       7                    27.74
## 552          945.0       3                     8.20
```

```
## 553          734.3       7                    9.62
## 555          734.3       7                   15.69
## 556          714.3      28                   27.94
## 557          704.3      28                   32.63
## 558          724.3       7                   17.24
## 559          714.3       7                   19.77
## 561          744.3      28                   25.75
## 562          734.3      28                   33.08
## 563          739.3       7                   24.07
## 564          689.3       7                   21.82
## 565          734.3      28                   21.07
## 566          769.3       7                   14.84
## 567          724.3      28                   32.05
## 568          759.3       7                   11.96
## 569          734.3       7                   25.45
## 570          784.3      28                   22.49
## 571          769.3      28                   25.22
## 572          674.3      28                   39.70
## 573          744.3       7                   13.09
## 574          689.3      28                   38.70
## 575          759.3       7                    7.51
## 576          789.3      28                   17.58
## 577          754.3       7                   21.18
## 578          759.3      28                   18.20
## 579          704.3       7                   17.20
## 580          759.3      28                   22.63
## 581          704.3       7                   21.86
## 582          714.3       7                   12.37
## 583          724.3      28                   25.73
## 584          689.3      28                   37.81
## 585          674.3       7                   21.92
## 586          704.3      28                   33.04
## 587          784.3       7                   14.54
## 588          734.3      28                   26.91
## 589          764.3       7                    8.00
## 590          754.3      28                   31.90
## 591          789.3       7                   10.34
## 592          784.3      28                   19.77
## 593          739.3      28                   37.44
## 594          784.3       7                   11.48
## 595          689.3       7                   24.44
## 596          764.3      28                   17.60
## 597          724.3       7                   10.73
## 598          714.3      28                   31.38
## 599          781.0       3                   13.22
## 600          781.0       7                   20.97
## 601          781.0      14                   27.04
## 602          781.0      28                   32.04
## 603          781.0      90                   35.17
## 606          885.0       3                    6.47
```

```
## 607          885.0      14                      12.84
## 608          885.0      28                      18.42
## 609          885.0      90                      21.95
## 612          856.0      14                      21.26
## 613          856.0      28                      25.97
## 614          856.0       3                      11.36
## 615          856.0      90                      31.25
## 618          863.0       3                       9.31
## 619          863.0      90                      26.94
## 624          812.0       3                      12.54
## 625          812.0      28                      27.53
## 626          812.0      90                      32.92
## 627          885.0       7                       9.99
## 628          845.0       7                       7.84
## 629          845.0      28                      12.25
## 630          833.0       7                      11.17
## 631          833.0      28                      17.34
## 632          783.0       7                      17.54
## 633          783.0      28                      30.57
## 634          808.0       7                      14.20
## 635          808.0      28                      24.50
## 636          795.0       7                      15.58
## 637          795.0      28                      26.85
## 638          758.0       7                      26.06
## 639          758.0      28                      38.21
## 640          745.0      28                      43.70
## 641          745.0       7                      30.14
## 642          820.0       7                      12.73
## 643          820.0      28                      20.87
## 644          770.0       7                      20.28
## 645          770.0      28                      34.29
## 646          630.0       7                      19.54
## 647          694.1      90                      47.71
## 648          781.2      90                      43.38
## 649          748.5      28                      29.89
## 650          692.6       3                       6.90
## 651          800.1      90                      33.19
## 652          800.0       3                       4.90
## 653          942.0       3                       4.57
## 654          942.0      90                      25.46
## 655          800.1      28                      24.29
## 656          692.6      28                      33.95
## 657          806.2       3                      11.41
## 658          849.0      28                      20.59
## 659          631.0       7                      25.89
## 660          849.0      90                      29.23
## 661          891.9      90                      31.02
## 662          748.5       7                      10.39
## 663          781.2      28                      33.66
## 664          839.2      28                      27.87
```

```
## 665          694.1       7                    19.35
## 666          856.8       7                    11.39
## 667          716.1       3                    12.79
## 668          716.1      28                    39.32
## 669          943.1       3                     4.78
## 670          717.8       3                    16.11
## 671          631.0      28                    43.38
## 672          749.1       7                    20.42
## 673          856.8       3                     6.94
## 674          750.0       7                    15.03
## 675          749.1       3                    13.57
## 676          800.0      90                    32.53
## 677          692.6       7                    15.75
## 678          942.0       7                     7.68
## 679          717.8      28                    38.80
## 680          750.0      28                    33.00
## 681          942.0      28                    17.28
## 682          856.8      28                    24.28
## 683          800.0      28                    24.05
## 684          839.2      90                    36.59
## 685          716.1      90                    50.73
## 686          839.2       7                    13.66
## 687          631.0       3                    14.14
## 688          749.1      90                    47.78
## 689          849.0       3                     2.33
## 690          781.2       7                    16.89
## 691          717.8       7                    23.52
## 692          750.0       3                     6.81
## 693          750.0      90                    39.70
## 694          943.1      28                    17.96
## 695          749.1      28                    32.88
## 696          891.9      28                    22.35
## 697          800.0       7                    10.79
## 698          849.0       7                     7.72
## 699          630.0      28                    41.68
## 700          630.0       3                     9.56
## 701          839.2       3                     6.88
## 702          717.8      90                    50.53
## 703          806.2       7                    17.17
## 704          806.2      28                    30.44
## 705          694.1       3                     9.73
## 706          800.1       3                     3.32
## 707          943.1      90                    26.32
## 708          806.2      90                    43.25
## 709          891.9       3                     6.28
## 710          856.8      90                    32.10
## 711          694.1      28                    36.96
## 712          631.0      90                    54.60
## 713          716.1       7                    21.48
## 714          781.2       3                     9.69
```

```
## 715          943.1       7                    8.37
## 716          748.5      90                   39.66
## 717          891.9       7                   10.09
## 718          748.5       3                    4.83
## 719          800.1       7                   10.35
## 720          692.6      90                   43.57
## 721          630.0      90                   51.86
## 722          830.0       3                   11.85
## 723          830.0       7                   17.24
## 724          830.0      28                   27.83
## 725          830.0      90                   35.76
## 726          830.0     120                   38.70
## 727          821.0       3                   14.31
## 728          821.0       7                   17.44
## 729          821.0      28                   31.74
## 730          821.0      90                   37.91
## 731          821.0     120                   39.38
## 732          809.0       3                   15.87
## 733          809.0       7                    9.01
## 734          809.0      28                   33.61
## 735          809.0      90                   40.66
## 736          809.0     120                   40.86
## 737          789.0       7                   12.05
## 738          789.0      28                   17.54
## 739          769.0       7                   18.91
## 740          769.0      28                   25.18
## 741          734.0       7                   30.96
## 742          721.0      28                   43.89
## 743          721.0      90                   54.28
## 744          734.0      28                   36.94
## 745          774.0       7                   14.50
## 746          774.0      28                   22.44
## 747          613.0       1                   12.64
## 748          613.0       3                   26.06
## 749          613.0       7                   33.21
## 750          613.0      14                   36.94
## 751          613.0      28                   44.09
## 752          613.0       7                   52.61
## 753          613.0      14                   59.76
## 754          613.0      28                   67.31
## 755          613.0      90                   69.66
## 758          775.0       7                   18.13
## 759          775.0      14                   22.53
## 760          775.0      28                   27.34
## 761          775.0      56                   29.98
## 762          775.0      90                   31.35
## 764          763.0       1                    6.27
## 765          763.0       3                   14.70
## 766          763.0       7                   23.22
## 767          763.0      14                   27.92
```

```
## 768          763.0      28                        31.35
## 771          806.0       3                        14.99
## 772          825.0       3                        13.52
## 773          739.0       7                        24.00
## 774          739.0      28                        37.42
## 775          784.0       7                        11.47
## 776          774.0      28                        22.44
## 777          754.0       7                        21.16
## 778          754.0      28                        31.84
## 779          769.0       7                        14.80
## 780          769.0      28                        25.18
## 781          789.0      28                        17.54
## 782          765.0       7                        14.20
## 783          765.0      28                        21.65
## 784          765.0      90                        29.39
## 785          825.0       3                        13.52
## 786          825.0       7                        16.26
## 787          825.0      28                        31.45
## 788          825.0      90                        37.23
## 789          806.0       7                        18.13
## 790          806.0      28                        32.72
## 791          806.0      90                        39.49
## 794          817.0      14                        18.13
## 797          613.0      90                        47.22
## 800          613.0       3                        41.64
## 801          784.0       7                        13.71
## 802          784.0      28                        19.69
## 803          754.0      28                        31.65
## 804          758.0       3                        19.11
## 805          758.0      28                        39.58
## 806          758.0      90                        48.79
## 807          739.0       7                        24.00
## 808          739.0      28                        37.42
## 809          784.0       7                        11.47
## 810          784.0      28                        19.69
## 811          850.0       7                        14.99
## 812          850.0      28                        27.92
## 813          850.0      90                        34.68
## 816          613.0       3                        33.80
## 817          613.0       7                        42.42
## 818          613.0      14                        48.40
## 819          613.0      28                        55.94
## 820          613.0      90                        58.78
## 822          800.0      14                        20.77
## 823          800.0      28                        25.18
## 825          817.0      28                        21.75
## 826          734.0      28                        39.09
## 827          721.0       3                        24.39
## 828          896.0       7                        50.51
## 829          896.0      28                        74.99
```

```
## 830          680.0     28                        37.17
## 831          741.0     28                        33.76
## 832          658.0     28                        16.50
## 833          829.0     28                        19.99
## 834          695.0     28                        36.35
## 835          651.0     28                        33.69
## 836          844.0     28                        15.42
## 837          722.0     28                        33.42
## 838          730.0     28                        39.05
## 839          720.0     28                        27.68
## 840          684.0     28                        26.86
## 841          804.0     28                        45.30
## 842          705.0     28                        30.12
## 843          772.0     28                        15.57
## 844          785.0     28                        44.61
## 845          655.0     28                        53.52
## 846          774.0     28                        57.21
## 847          757.0     28                        65.91
## 848          805.0     28                        52.82
## 849          821.0     28                        33.40
## 850          729.0     28                        18.03
## 851          698.0     28                        37.36
## 852          710.0     28                        32.84
## 853          815.0     28                        42.64
## 854          737.0     28                        40.06
## 855          696.0     28                        41.94
## 856          790.0     28                        61.23
## 857          778.0     28                        40.87
## 858          736.0     28                        33.30
## 859          709.0     28                        52.42
## 860          846.0     28                        15.09
## 861          783.0     28                        38.46
## 862          780.0     28                        37.26
## 864          829.0     28                        42.13
## 865          744.0     28                        31.87
## 866          790.0     28                        41.54
## 867          688.0     28                        39.45
## 868          827.0     28                        37.91
## 869          768.0     28                        44.28
## 870          813.0     28                        31.18
## 871          780.0     28                        23.69
## 872          789.0     28                        32.76
## 873          761.0     28                        32.40
## 875          689.0     28                        36.80
## 876          697.0     28                        18.28
## 877          872.0     28                        33.06
## 878          778.0     28                        31.42
## 879          795.0     28                        31.03
## 880          824.0     28                        44.39
## 881          816.0     28                        12.18
```

```
## 882          689.0      28                       25.56
## 883          753.0      28                       36.44
## 884          893.0      28                       32.96
## 885          728.0      28                       23.84
## 886          824.0      28                       26.23
## 887          830.0      28                       17.95
## 888          792.0      28                       40.68
## 889          822.0      28                       19.01
## 890          733.0      28                       33.72
## 891          713.0      28                        8.54
## 892          678.0      28                       13.46
## 893          762.0      28                       32.24
## 894          780.0      28                       23.52
## 895          643.0      28                       29.72
## 896          763.0      28                       49.77
## 897          759.0      28                       52.44
## 898          794.0      28                       40.93
## 899          817.0      28                       44.86
## 900          812.0      28                       13.20
## 901          675.0      28                       37.43
## 902          805.0      28                       29.87
## 903          802.0      28                       56.61
## 904          697.0      28                       12.46
## 905          868.0      28                       23.79
## 906          805.0      28                       13.29
## 907          745.0      28                       39.42
## 908          690.0      28                       46.23
## 909          822.0      28                       44.52
## 910          817.0      28                       23.74
## 911          774.0      28                       26.14
## 912          884.0      28                       15.52
## 913          666.0      28                       43.57
## 914          784.0      28                       35.86
## 915          689.0      28                       41.05
## 916          699.0      28                       28.99
## 917          760.0      28                       46.24
## 918          828.0      28                       26.92
## 919          869.0      28                       10.54
## 920          822.0      28                       25.10
## 921          764.0      28                       29.07
## 922          868.0      28                        9.74
## 923          749.0      28                       33.80
## 924          638.0      28                       39.84
## 925          783.0      28                       26.97
## 926          641.0      28                       27.23
## 927          680.0      28                       30.65
## 928          704.0      28                       33.05
## 929          623.0      28                       24.58
## 930          643.0      28                       21.91
## 931          669.0      28                       30.88
```

```
## 932          709.0     28                    15.34
## 933          612.0     28                    24.34
## 934          636.0     28                    23.89
## 935          623.0     28                    22.93
## 936          614.0     28                    29.41
## 938          688.7     28                    36.80
## 939          696.7     28                    18.29
## 940          871.8     28                    32.72
## 941          778.4     28                    31.42
## 942          795.3     28                    28.94
## 943          824.0     28                    40.93
## 944          815.9     28                    12.18
## 945          688.7     28                    25.56
## 946          753.4     28                    36.44
## 947          892.7     28                    32.96
## 948          727.6     28                    23.84
## 949          824.0     28                    26.23
## 950          830.1     28                    17.96
## 951          792.5     28                    38.63
## 952          822.2     28                    19.01
## 953          732.6     28                    33.72
## 954          712.9     28                     8.54
## 955          678.0     28                    13.46
## 956          762.2     28                    32.25
## 957          780.3     28                    23.52
## 958          643.5     28                    29.73
## 959          762.9     28                    49.77
## 960          759.5     28                    52.45
## 961          794.2     28                    40.93
## 962          816.8     28                    44.87
## 963          811.5     28                    13.20
## 964          674.8     28                    37.43
## 965          805.3     28                    29.87
## 966          802.3     28                    56.62
## 967          696.7     28                    12.46
## 968          867.7     28                    23.79
## 969          804.9     28                    13.29
## 970          744.5     28                    39.42
## 971          690.2     28                    46.23
## 972          822.2     28                    44.52
## 973          816.8     28                    23.74
## 974          774.3     28                    26.15
## 975          884.3     28                    15.53
## 976          665.6     28                    43.58
## 977          784.0     28                    35.87
## 978          688.7     28                    41.05
## 979          698.5     28                    28.99
## 980          760.1     28                    46.25
## 981          828.5     28                    26.92
## 982          868.7     28                    10.54
```

```
## 983          822.2     28                      25.10
## 984          764.4     28                      29.07
## 985          867.7     28                       9.74
## 986          749.3     28                      33.80
## 987          679.7     28                      37.17
## 988          741.4     28                      33.76
## 989          657.9     28                      16.50
## 990          829.5     28                      19.99
## 991          694.6     28                      36.35
## 992          651.2     28                      38.22
## 993          844.5     28                      15.42
## 994          722.5     28                      33.42
## 995          730.4     28                      39.06
## 996          719.7     28                      27.68
## 997          683.9     28                      26.86
## 998          804.0     28                      45.30
## 999          705.2     28                      30.12
## 1000         772.2     28                      15.57
## 1001         785.3     28                      44.61
## 1002         655.3     28                      53.52
## 1003         774.0     28                      57.22
## 1004         756.9     28                      65.91
## 1005         804.9     28                      52.83
## 1006         821.4     28                      33.40
## 1007         728.9     28                      18.03
## 1008         697.7     28                      37.36
## 1009         709.7     28                      35.31
## 1010         815.2     28                      42.64
## 1011         736.6     28                      40.06
## 1012         695.9     28                      43.80
## 1013         790.0     28                      61.24
## 1014         778.4     28                      40.87
## 1015         735.6     28                      33.31
## 1016         709.5     28                      52.43
## 1017         846.0     28                      15.09
## 1018         782.9     28                      38.46
## 1019         779.7     28                      37.27
## 1021         829.5     28                      42.14
## 1022         744.2     28                      31.88
## 1023         790.4     28                      41.54
## 1024         688.2     28                      39.46
## 1025         826.8     28                      37.92
## 1026         768.3     28                      44.28
## 1027         813.4     28                      31.18
## 1028         780.0     28                      23.70
## 1029         788.9     28                      32.77
## 1030         761.5     28                      32.40
```

```
cleaned_data_2<-remove_outlier(cleaned_data_1,
c('Cement','Blast_Furnace_Slag','Fly_Ash','Water','Superplasticizer','Coarse_
Aggregate','Fine_Aggregate','Age_day','Concrete_compressive_strength'))
```

```
## [1] "Remove outliers"
##      Cement Blast_Furnace_Slag Fly_Ash Water Superplasticizer
Coarse_Aggregate
## 2     540.0                0.0     0.0 162.0              2.5
1055.0
## 9     266.0              114.0     0.0 228.0              0.0
932.0
## 12    198.6              132.4     0.0 192.0              0.0
978.4
## 15    304.0               76.0     0.0 228.0              0.0
932.0
## 22    139.6              209.4     0.0 192.0              0.0
1047.0
## 23    139.6              209.4     0.0 192.0              0.0
1047.0
## 47    349.0                0.0     0.0 192.0              0.0
1047.0
## 55    139.6              209.4     0.0 192.0              0.0
1047.0
## 56    198.6              132.4     0.0 192.0              0.0
978.4
## 58    198.6              132.4     0.0 192.0              0.0
978.4
## 63    310.0                0.0     0.0 192.0              0.0
971.0
## 69    190.0              190.0     0.0 228.0              0.0
932.0
## 70    485.0                0.0     0.0 146.0              0.0
1120.0
## 71    374.0              189.2     0.0 170.1             10.1
926.1
## 73    425.0              106.3     0.0 153.5             16.5
852.1
## 74    425.0              106.3     0.0 151.4             18.6
936.0
## 76    475.0              118.8     0.0 181.1              8.9
852.1
## 78    425.0              106.3     0.0 153.5             16.5
852.1
## 79    388.6               97.1     0.0 157.9             12.1
852.1
## 81    425.0              106.3     0.0 153.5             16.5
852.1
## 82    318.8              212.5     0.0 155.7             14.3
852.1
## 83    401.8               94.7     0.0 147.4             11.4
```

```
946.8
## 84    362.6             189.0     0.0 164.9            11.6
944.7
## 85    323.7             282.8     0.0 183.8            10.3
942.7
## 87    362.6             189.0     0.0 164.9            11.6
944.7
## 88    286.3             200.9     0.0 144.7            11.2
1004.6
## 89    362.6             189.0     0.0 164.9            11.6
944.7
## 90    439.0             177.0     0.0 186.0            11.1
884.9
## 91    389.9             189.0     0.0 145.9            22.0
944.7
## 92    362.6             189.0     0.0 164.9            11.6
944.7
## 93    337.9             189.0     0.0 174.9             9.5
944.7
## 94    374.0             189.2     0.0 170.1            10.1
926.1
## 96    425.0             106.3     0.0 153.5            16.5
852.1
## 97    425.0             106.3     0.0 151.4            18.6
936.0
## 99    475.0             118.8     0.0 181.1             8.9
852.1
## 101   425.0             106.3     0.0 153.5            16.5
852.1
## 102   388.6              97.1     0.0 157.9            12.1
852.1
## 104   425.0             106.3     0.0 153.5            16.5
852.1
## 105   318.8             212.5     0.0 155.7            14.3
852.1
## 106   401.8              94.7     0.0 147.4            11.4
946.8
## 107   362.6             189.0     0.0 164.9            11.6
944.7
## 108   323.7             282.8     0.0 183.8            10.3
942.7
## 110   362.6             189.0     0.0 164.9            11.6
944.7
## 111   286.3             200.9     0.0 144.7            11.2
1004.6
## 112   362.6             189.0     0.0 164.9            11.6
944.7
## 113   439.0             177.0     0.0 186.0            11.1
884.9
## 114   389.9             189.0     0.0 145.9            22.0
```

```
944.7
## 115   362.6             189.0     0.0 164.9             11.6
944.7
## 116   337.9             189.0     0.0 174.9              9.5
944.7
## 117   374.0             189.2     0.0 170.1             10.1
926.1
## 119   425.0             106.3     0.0 153.5             16.5
852.1
## 120   425.0             106.3     0.0 151.4             18.6
936.0
## 122   475.0             118.8     0.0 181.1              8.9
852.1
## 124   425.0             106.3     0.0 153.5             16.5
852.1
## 125   388.6              97.1     0.0 157.9             12.1
852.1
## 127   425.0             106.3     0.0 153.5             16.5
852.1
## 128   318.8             212.5     0.0 155.7             14.3
852.1
## 129   401.8              94.7     0.0 147.4             11.4
946.8
## 130   362.6             189.0     0.0 164.9             11.6
944.7
## 133   362.6             189.0     0.0 164.9             11.6
944.7
## 134   286.3             200.9     0.0 144.7             11.2
1004.6
## 135   362.6             189.0     0.0 164.9             11.6
944.7
## 136   439.0             177.0     0.0 186.0             11.1
884.9
## 138   362.6             189.0     0.0 164.9             11.6
944.7
## 139   337.9             189.0     0.0 174.9              9.5
944.7
## 140   374.0             189.2     0.0 170.1             10.1
926.1
## 142   425.0             106.3     0.0 153.5             16.5
852.1
## 143   425.0             106.3     0.0 151.4             18.6
936.0
## 145   475.0             118.8     0.0 181.1              8.9
852.1
## 147   425.0             106.3     0.0 153.5             16.5
852.1
## 148   388.6              97.1     0.0 157.9             12.1
852.1
## 150   425.0             106.3     0.0 153.5             16.5
```

```
852.1
## 151   318.8             212.5     0.0 155.7            14.3
852.1
## 157   286.3             200.9     0.0 144.7            11.2
1004.6
## 159   439.0             177.0     0.0 186.0            11.1
884.9
## 162   337.9             189.0     0.0 174.9             9.5
944.7
## 185   222.4               0.0    96.7 189.3             4.5
967.1
## 186   222.4               0.0    96.7 189.3             4.5
967.1
## 187   222.4               0.0    96.7 189.3             4.5
967.1
## 188   222.4               0.0    96.7 189.3             4.5
967.1
## 190   233.8               0.0    94.6 197.9             4.6
947.0
## 191   233.8               0.0    94.6 197.9             4.6
947.0
## 192   233.8               0.0    94.6 197.9             4.6
947.0
## 193   233.8               0.0    94.6 197.9             4.6
947.0
## 195   194.7               0.0   100.5 165.6             7.5
1006.4
## 196   194.7               0.0   100.5 165.6             7.5
1006.4
## 197   194.7               0.0   100.5 165.6             7.5
1006.4
## 198   194.7               0.0   100.5 165.6             7.5
1006.4
## 200   190.7               0.0   125.4 162.1             7.8
1090.0
## 201   190.7               0.0   125.4 162.1             7.8
1090.0
## 202   190.7               0.0   125.4 162.1             7.8
1090.0
## 203   190.7               0.0   125.4 162.1             7.8
1090.0
## 205   212.1               0.0   121.6 180.3             5.7
1057.6
## 206   212.1               0.0   121.6 180.3             5.7
1057.6
## 207   212.1               0.0   121.6 180.3             5.7
1057.6
## 208   212.1               0.0   121.6 180.3             5.7
1057.6
## 210   230.0               0.0   118.3 195.5             4.6
```

```
1029.4
## 211   230.0               0.0   118.3 195.5             4.6
1029.4
## 212   230.0               0.0   118.3 195.5             4.6
1029.4
## 213   230.0               0.0   118.3 195.5             4.6
1029.4
## 215   190.3               0.0   125.2 161.9             9.9
1088.1
## 216   190.3               0.0   125.2 161.9             9.9
1088.1
## 217   190.3               0.0   125.2 161.9             9.9
1088.1
## 218   190.3               0.0   125.2 161.9             9.9
1088.1
## 220   166.1               0.0   163.3 176.5             4.5
1058.6
## 221   166.1               0.0   163.3 176.5             4.5
1058.6
## 222   166.1               0.0   163.3 176.5             4.5
1058.6
## 223   166.1               0.0   163.3 176.5             4.5
1058.6
## 230   213.7              98.1    24.5 181.7             6.9
1065.8
## 231   213.7              98.1    24.5 181.7             6.9
1065.8
## 232   213.7              98.1    24.5 181.7             6.9
1065.8
## 233   213.7              98.1    24.5 181.7             6.9
1065.8
## 235   213.8              98.1    24.5 181.7             6.7
1066.0
## 236   213.8              98.1    24.5 181.7             6.7
1066.0
## 237   213.8              98.1    24.5 181.7             6.7
1066.0
## 238   213.8              98.1    24.5 181.7             6.7
1066.0
## 240   229.7               0.0   118.2 195.2             6.1
1028.1
## 241   229.7               0.0   118.2 195.2             6.1
1028.1
## 242   229.7               0.0   118.2 195.2             6.1
1028.1
## 243   229.7               0.0   118.2 195.2             6.1
1028.1
## 245   238.1               0.0    94.1 186.7             7.0
949.9
## 246   238.1               0.0    94.1 186.7             7.0
```

```
949.9
## 247   238.1               0.0    94.1 186.7             7.0
949.9
## 248   238.1               0.0    94.1 186.7             7.0
949.9
## 250   250.0               0.0    95.7 187.4             5.5
956.9
## 251   250.0               0.0    95.7 187.4             5.5
956.9
## 252   250.0               0.0    95.7 187.4             5.5
956.9
## 253   250.0               0.0    95.7 187.4             5.5
956.9
## 255   212.5               0.0   100.4 159.3             8.7
1007.8
## 256   212.5               0.0   100.4 159.3             8.7
1007.8
## 257   212.5               0.0   100.4 159.3             8.7
1007.8
## 258   212.5               0.0   100.4 159.3             8.7
1007.8
## 260   212.6               0.0   100.4 159.4            10.4
1003.8
## 261   212.6               0.0   100.4 159.4            10.4
1003.8
## 262   212.6               0.0   100.4 159.4            10.4
1003.8
## 263   212.6               0.0   100.4 159.4            10.4
1003.8
## 265   212.0               0.0   124.8 159.0             7.8
1085.4
## 266   212.0               0.0   124.8 159.0             7.8
1085.4
## 267   212.0               0.0   124.8 159.0             7.8
1085.4
## 268   212.0               0.0   124.8 159.0             7.8
1085.4
## 270   231.8               0.0   121.6 174.0             6.7
1056.4
## 271   231.8               0.0   121.6 174.0             6.7
1056.4
## 272   231.8               0.0   121.6 174.0             6.7
1056.4
## 273   231.8               0.0   121.6 174.0             6.7
1056.4
## 275   251.4               0.0   118.3 188.5             5.8
1028.4
## 276   251.4               0.0   118.3 188.5             5.8
1028.4
## 277   251.4               0.0   118.3 188.5             5.8
```

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1028.4
## 278   251.4               0.0   118.3 188.5             5.8
1028.4
## 280   251.4               0.0   118.3 188.5             6.4
1028.4
## 281   251.4               0.0   118.3 188.5             6.4
1028.4
## 282   251.4               0.0   118.3 188.5             6.4
1028.4
## 283   251.4               0.0   118.3 188.5             6.4
1028.4
## 285   181.4               0.0   167.0 169.6             7.6
1055.6
## 286   181.4               0.0   167.0 169.6             7.6
1055.6
## 287   181.4               0.0   167.0 169.6             7.6
1055.6
## 288   181.4               0.0   167.0 169.6             7.6
1055.6
## 290   182.0              45.2   122.0 170.2             8.2
1059.4
## 291   182.0              45.2   122.0 170.2             8.2
1059.4
## 292   182.0              45.2   122.0 170.2             8.2
1059.4
## 293   182.0              45.2   122.0 170.2             8.2
1059.4
## 295   168.9              42.2   124.3 158.3            10.8
1080.8
## 296   168.9              42.2   124.3 158.3            10.8
1080.8
## 297   168.9              42.2   124.3 158.3            10.8
1080.8
## 298   168.9              42.2   124.3 158.3            10.8
1080.8
## 300   290.4               0.0    96.2 168.1             9.4
961.2
## 301   290.4               0.0    96.2 168.1             9.4
961.2
## 302   290.4               0.0    96.2 168.1             9.4
961.2
## 303   290.4               0.0    96.2 168.1             9.4
961.2
## 305   277.1               0.0    97.4 160.6            11.8
973.9
## 306   277.1               0.0    97.4 160.6            11.8
973.9
## 307   277.1               0.0    97.4 160.6            11.8
973.9
## 308   277.1               0.0    97.4 160.6            11.8
```

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973.9
## 310   295.7               0.0    95.6 171.5             8.9
955.1
## 311   295.7               0.0    95.6 171.5             8.9
955.1
## 312   295.7               0.0    95.6 171.5             8.9
955.1
## 313   295.7               0.0    95.6 171.5             8.9
955.1
## 315   251.8               0.0    99.9 146.1            12.4
1006.0
## 316   251.8               0.0    99.9 146.1            12.4
1006.0
## 317   251.8               0.0    99.9 146.1            12.4
1006.0
## 318   251.8               0.0    99.9 146.1            12.4
1006.0
## 320   249.1               0.0    98.8 158.1            12.8
987.8
## 321   249.1               0.0    98.8 158.1            12.8
987.8
## 322   249.1               0.0    98.8 158.1            12.8
987.8
## 323   249.1               0.0    98.8 158.1            12.8
987.8
## 325   252.3               0.0    98.8 146.3            14.2
987.8
## 326   252.3               0.0    98.8 146.3            14.2
987.8
## 327   252.3               0.0    98.8 146.3            14.2
987.8
## 328   252.3               0.0    98.8 146.3            14.2
987.8
## 330   246.8               0.0   125.1 143.3            12.0
1086.8
## 331   246.8               0.0   125.1 143.3            12.0
1086.8
## 332   246.8               0.0   125.1 143.3            12.0
1086.8
## 333   246.8               0.0   125.1 143.3            12.0
1086.8
## 335   275.1               0.0   121.4 159.5             9.9
1053.6
## 336   275.1               0.0   121.4 159.5             9.9
1053.6
## 337   275.1               0.0   121.4 159.5             9.9
1053.6
## 338   275.1               0.0   121.4 159.5             9.9
1053.6
## 340   297.2               0.0   117.5 174.8             9.5
```

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1022.8
## 341   297.2               0.0   117.5 174.8             9.5
1022.8
## 342   297.2               0.0   117.5 174.8             9.5
1022.8
## 343   297.2               0.0   117.5 174.8             9.5
1022.8
## 345   213.7               0.0   174.7 154.8            10.2
1053.5
## 346   213.7               0.0   174.7 154.8            10.2
1053.5
## 347   213.7               0.0   174.7 154.8            10.2
1053.5
## 348   213.7               0.0   174.7 154.8            10.2
1053.5
## 350   213.5               0.0   174.2 154.6            11.7
1052.3
## 351   213.5               0.0   174.2 154.6            11.7
1052.3
## 352   213.5               0.0   174.2 154.6            11.7
1052.3
## 353   213.5               0.0   174.2 154.6            11.7
1052.3
## 355   277.2              97.8    24.5 160.7            11.2
1061.7
## 356   277.2              97.8    24.5 160.7            11.2
1061.7
## 357   277.2              97.8    24.5 160.7            11.2
1061.7
## 358   277.2              97.8    24.5 160.7            11.2
1061.7
## 360   218.2              54.6   123.8 140.8            11.9
1075.7
## 361   218.2              54.6   123.8 140.8            11.9
1075.7
## 362   218.2              54.6   123.8 140.8            11.9
1075.7
## 363   218.2              54.6   123.8 140.8            11.9
1075.7
## 365   214.9              53.8   121.9 155.6             9.6
1014.3
## 366   214.9              53.8   121.9 155.6             9.6
1014.3
## 367   214.9              53.8   121.9 155.6             9.6
1014.3
## 368   214.9              53.8   121.9 155.6             9.6
1014.3
## 370   218.9               0.0   124.1 158.5            11.3
1078.7
## 371   218.9               0.0   124.1 158.5            11.3
```

```
1078.7
## 372   218.9               0.0   124.1 158.5            11.3
1078.7
## 373   218.9               0.0   124.1 158.5            11.3
1078.7
## 375   376.0               0.0     0.0 214.6             0.0
1003.5
## 376   376.0               0.0     0.0 214.6             0.0
1003.5
## 377   376.0               0.0     0.0 214.6             0.0
1003.5
## 378   376.0               0.0     0.0 214.6             0.0
1003.5
## 380   500.0               0.0     0.0 140.0             4.0
966.0
## 381   475.0               0.0    59.0 142.0             1.9
1098.0
## 385   516.0               0.0     0.0 162.0             8.2
801.0
## 386   520.0               0.0     0.0 170.0             5.2
855.0
## 387   528.0               0.0     0.0 185.0             6.9
920.0
## 388   520.0               0.0     0.0 175.0             5.2
870.0
## 389   385.0               0.0   136.0 158.0            20.0
903.0
## 392   397.0              17.2   158.0 167.0            20.8
967.0
## 393   333.0              17.5   163.0 167.0            17.9
996.0
## 394   334.0              17.6   158.0 189.0            15.3
967.0
## 395   405.0               0.0     0.0 175.0             0.0
1120.0
## 396   200.0             200.0     0.0 190.0             0.0
1145.0
## 397   516.0               0.0     0.0 162.0             8.3
801.0
## 398   145.0             116.0   119.0 184.0             5.7
833.0
## 399   160.0             128.0   122.0 182.0             6.4
824.0
## 400   234.0             156.0     0.0 189.0             5.9
981.0
## 401   250.0             180.0    95.0 159.0             9.5
860.0
## 402   475.0               0.0     0.0 162.0             9.5
1044.0
## 403   285.0             190.0     0.0 163.0             7.6
```

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1031.0
## 404   356.0             119.0     0.0 160.0             9.0
1061.0
## 406   500.0               0.0     0.0 151.0             9.0
1033.0
## 407   165.0               0.0   143.6 163.8             0.0
1005.6
## 408   165.0             128.5   132.1 175.1             8.1
1005.8
## 409   178.0             129.8   118.6 179.9             3.6
1007.3
## 410   167.4             129.9   128.6 175.5             7.8
1006.3
## 411   172.4              13.6   172.4 156.8             4.1
1006.3
## 412   173.5              50.1   173.5 164.8             6.5
1006.2
## 413   167.0              75.4   167.0 164.0             7.9
1007.3
## 414   173.8              93.4   159.9 172.3             9.7
1007.2
## 415   190.3               0.0   125.2 166.6             9.9
1079.0
## 416   250.0               0.0    95.7 191.8             5.3
948.9
## 417   213.5               0.0   174.2 159.2            11.7
1043.6
## 418   194.7               0.0   100.5 170.2             7.5
998.0
## 419   251.4               0.0   118.3 192.9             5.8
1043.6
## 420   165.0               0.0   143.6 163.8             0.0
1005.6
## 421   165.0             128.5   132.1 175.1             8.1
1005.8
## 422   178.0             129.8   118.6 179.9             3.6
1007.3
## 423   167.4             129.9   128.6 175.5             7.8
1006.3
## 424   172.4              13.6   172.4 156.8             4.1
1006.3
## 425   173.5              50.1   173.5 164.8             6.5
1006.2
## 426   167.0              75.4   167.0 164.0             7.9
1007.3
## 427   173.8              93.4   159.9 172.3             9.7
1007.2
## 428   190.3               0.0   125.2 166.6             9.9
1079.0
## 429   250.0               0.0    95.7 191.8             5.3
```

```
948.9
## 430   213.5               0.0   174.2 159.2            11.7
1043.6
## 431   194.7               0.0   100.5 170.2             7.5
998.0
## 432   251.4               0.0   118.3 192.9             5.8
1043.6
## 433   165.0               0.0   143.6 163.8             0.0
1005.6
## 434   165.0             128.5   132.1 175.1             8.1
1005.8
## 435   178.0             129.8   118.6 179.9             3.6
1007.3
## 436   167.4             129.9   128.6 175.5             7.8
1006.3
## 437   172.4              13.6   172.4 156.8             4.1
1006.3
## 438   173.5              50.1   173.5 164.8             6.5
1006.2
## 439   167.0              75.4   167.0 164.0             7.9
1007.3
## 440   173.8              93.4   159.9 172.3             9.7
1007.2
## 441   190.3               0.0   125.2 166.6             9.9
1079.0
## 442   250.0               0.0    95.7 191.8             5.3
948.9
## 443   213.5               0.0   174.2 159.2            11.7
1043.6
## 444   194.7               0.0   100.5 170.2             7.5
998.0
## 445   251.4               0.0   118.3 192.9             5.8
1043.6
## 446   165.0               0.0   143.6 163.8             0.0
1005.6
## 447   165.0             128.5   132.1 175.1             8.1
1005.8
## 448   178.0             129.8   118.6 179.9             3.6
1007.3
## 449   167.4             129.9   128.6 175.5             7.8
1006.3
## 450   172.4              13.6   172.4 156.8             4.1
1006.3
## 451   173.5              50.1   173.5 164.8             6.5
1006.2
## 452   167.0              75.4   167.0 164.0             7.9
1007.3
## 453   173.8              93.4   159.9 172.3             9.7
1007.2
## 454   190.3               0.0   125.2 166.6             9.9
```

```
1079.0
## 455   250.0               0.0    95.7 191.8             5.3
948.9
## 456   213.5               0.0   174.2 159.2            11.7
1043.6
## 457   194.7               0.0   100.5 170.2             7.5
998.0
## 458   251.4               0.0   118.3 192.9             5.8
1043.6
## 472   446.0              24.0    79.0 162.0            11.6
967.0
## 473   446.0              24.0    79.0 162.0            11.6
967.0
## 474   446.0              24.0    79.0 162.0            11.6
967.0
## 475   446.0              24.0    79.0 162.0            10.3
967.0
## 476   446.0              24.0    79.0 162.0            11.6
967.0
## 477   446.0              24.0    79.0 162.0            11.6
967.0
## 478   446.0              24.0    79.0 162.0            11.6
967.0
## 479   446.0              24.0    79.0 162.0            11.6
967.0
## 480   446.0              24.0    79.0 162.0            11.6
967.0
## 481   446.0              24.0    79.0 162.0            11.6
967.0
## 482   446.0              24.0    79.0 162.0            11.6
967.0
## 483   446.0              24.0    79.0 162.0            11.6
967.0
## 484   446.0              24.0    79.0 162.0            11.6
967.0
## 485   446.0              24.0    79.0 162.0            10.3
967.0
## 486   387.0              20.0    94.0 157.0            14.3
938.0
## 487   387.0              20.0    94.0 157.0            13.9
938.0
## 488   387.0              20.0    94.0 157.0            11.6
938.0
## 489   387.0              20.0    94.0 157.0            14.3
938.0
## 490   387.0              20.0    94.0 157.0            13.9
938.0
## 491   387.0              20.0    94.0 157.0            11.6
938.0
## 492   387.0              20.0    94.0 157.0            14.3
```

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938.0
## 493   387.0              20.0    94.0 157.0            13.9
938.0
## 494   387.0              20.0    94.0 157.0            11.6
938.0
## 495   387.0              20.0    94.0 157.0            14.3
938.0
## 496   387.0              20.0    94.0 157.0            13.9
938.0
## 497   387.0              20.0    94.0 157.0            11.6
938.0
## 498   355.0              19.0    97.0 145.0            13.1
967.0
## 499   355.0              19.0    97.0 145.0            12.3
967.0
## 500   491.0              26.0   123.0 210.0             3.9
882.0
## 501   491.0              26.0   123.0 201.0             3.9
822.0
## 502   491.0              26.0   123.0 210.0             3.9
882.0
## 503   491.0              26.0   123.0 210.0             3.9
882.0
## 504   491.0              26.0   123.0 210.0             3.9
882.0
## 505   491.0              26.0   123.0 201.0             3.9
822.0
## 506   491.0              26.0   123.0 201.0             3.9
822.0
## 507   491.0              26.0   123.0 201.0             3.9
822.0
## 508   424.0              22.0   132.0 178.0             8.5
822.0
## 509   424.0              22.0   132.0 178.0             8.5
882.0
## 510   424.0              22.0   132.0 168.0             8.9
822.0
## 511   424.0              22.0   132.0 178.0             8.5
822.0
## 512   424.0              22.0   132.0 178.0             8.5
822.0
## 513   424.0              22.0   132.0 168.0             8.9
822.0
## 514   424.0              22.0   132.0 168.0             8.9
822.0
## 516   202.0              11.0   141.0 206.0             1.7
942.0
## 517   202.0              11.0   141.0 206.0             1.7
942.0
## 518   202.0              11.0   141.0 206.0             1.7
```

```
942.0
## 519   202.0              11.0   141.0 206.0             1.7
942.0
## 520   284.0              15.0   141.0 179.0             5.5
842.0
## 521   284.0              15.0   141.0 179.0             5.5
842.0
## 522   284.0              15.0   141.0 179.0             5.5
842.0
## 523   284.0              15.0   141.0 179.0             5.5
842.0
## 524   359.0              19.0   141.0 154.0            10.9
942.0
## 525   359.0              19.0   141.0 154.0            10.9
942.0
## 526   359.0              19.0   141.0 154.0            10.9
942.0
## 527   359.0              19.0   141.0 154.0            10.9
942.0
## 528   359.0              19.0   141.0 154.0            10.9
942.0
## 529   359.0              19.0   141.0 154.0            10.9
942.0
## 530   359.0              19.0   141.0 154.0            10.9
942.0
## 531   359.0              19.0   141.0 154.0            10.9
942.0
## 532   436.0               0.0     0.0 218.0             0.0
838.4
## 534   289.0               0.0     0.0 192.0             0.0
913.2
## 535   393.0               0.0     0.0 192.0             0.0
940.6
## 537   393.0               0.0     0.0 192.0             0.0
940.6
## 538   480.0               0.0     0.0 192.0             0.0
936.2
## 539   480.0               0.0     0.0 192.0             0.0
936.2
## 541   480.0               0.0     0.0 192.0             0.0
936.2
## 542   333.0               0.0     0.0 192.0             0.0
931.2
## 545   289.0               0.0     0.0 192.0             0.0
913.2
## 547   333.0               0.0     0.0 192.0             0.0
931.2
## 548   333.0               0.0     0.0 192.0             0.0
931.2
## 549   289.0               0.0     0.0 192.0             0.0
```

```
913.2
## 551   393.0              0.0     0.0 192.0             0.0
940.6
## 553   158.8            238.2     0.0 185.7             0.0
1040.6
## 555   238.2            158.8     0.0 185.7             0.0
1040.6
## 556   181.9            272.8     0.0 185.7             0.0
1012.4
## 557   193.5            290.2     0.0 185.7             0.0
998.2
## 558   255.5            170.3     0.0 185.7             0.0
1026.6
## 559   272.8            181.9     0.0 185.7             0.0
1012.4
## 561   220.8            147.2     0.0 185.7             0.0
1055.0
## 562   397.0              0.0     0.0 185.7             0.0
1040.6
## 563   382.5              0.0     0.0 185.7             0.0
1047.8
## 564   210.7            316.1     0.0 185.7             0.0
977.0
## 565   158.8            238.2     0.0 185.7             0.0
1040.6
## 566   295.8              0.0     0.0 185.7             0.0
1091.4
## 567   255.5            170.3     0.0 185.7             0.0
1026.6
## 568   203.5            135.7     0.0 185.7             0.0
1076.2
## 569   397.0              0.0     0.0 185.7             0.0
1040.6
## 570   381.4              0.0     0.0 185.7             0.0
1104.6
## 571   295.8              0.0     0.0 185.7             0.0
1091.4
## 572   228.0            342.1     0.0 185.7             0.0
955.8
## 573   220.8            147.2     0.0 185.7             0.0
1055.0
## 574   316.1            210.7     0.0 185.7             0.0
977.0
## 575   135.7            203.5     0.0 185.7             0.0
1076.2
## 576   238.1              0.0     0.0 185.7             0.0
1118.8
## 577   339.2              0.0     0.0 185.7             0.0
1069.2
## 578   135.7            203.5     0.0 185.7             0.0
```

```
1076.2
## 579   193.5             290.2     0.0 185.7             0.0
998.2
## 580   203.5             135.7     0.0 185.7             0.0
1076.2
## 581   290.2             193.5     0.0 185.7             0.0
998.2
## 582   181.9             272.8     0.0 185.7             0.0
1012.4
## 583   170.3             155.5     0.0 185.7             0.0
1026.6
## 584   210.7             316.1     0.0 185.7             0.0
977.0
## 585   228.0             342.1     0.0 185.7             0.0
955.8
## 586   290.2             193.5     0.0 185.7             0.0
998.2
## 587   381.4               0.0     0.0 185.7             0.0
1104.6
## 588   238.2             158.8     0.0 185.7             0.0
1040.6
## 589   186.2             124.1     0.0 185.7             0.0
1083.4
## 590   339.2               0.0     0.0 185.7             0.0
1069.2
## 591   238.1               0.0     0.0 185.7             0.0
1118.8
## 592   252.5               0.0     0.0 185.7             0.0
1111.6
## 593   382.5               0.0     0.0 185.7             0.0
1047.8
## 594   252.5               0.0     0.0 185.7             0.0
1111.6
## 595   316.1             210.7     0.0 185.7             0.0
977.0
## 596   186.2             124.1     0.0 185.7             0.0
1083.4
## 597   170.3             155.5     0.0 185.7             0.0
1026.6
## 598   272.8             181.9     0.0 185.7             0.0
1012.4
## 599   339.0               0.0     0.0 197.0             0.0
968.0
## 600   339.0               0.0     0.0 197.0             0.0
968.0
## 601   339.0               0.0     0.0 197.0             0.0
968.0
## 602   339.0               0.0     0.0 197.0             0.0
968.0
## 606   236.0               0.0     0.0 194.0             0.0
```

```
968.0
## 607   236.0               0.0     0.0 194.0             0.0
968.0
## 608   236.0               0.0     0.0 194.0             0.0
968.0
## 612   277.0               0.0     0.0 191.0             0.0
968.0
## 613   277.0               0.0     0.0 191.0             0.0
968.0
## 614   277.0               0.0     0.0 191.0             0.0
968.0
## 618   254.0               0.0     0.0 198.0             0.0
968.0
## 624   307.0               0.0     0.0 193.0             0.0
968.0
## 625   307.0               0.0     0.0 193.0             0.0
968.0
## 627   236.0               0.0     0.0 193.0             0.0
968.0
## 628   200.0               0.0     0.0 180.0             0.0
1125.0
## 629   200.0               0.0     0.0 180.0             0.0
1125.0
## 630   225.0               0.0     0.0 181.0             0.0
1113.0
## 631   225.0               0.0     0.0 181.0             0.0
1113.0
## 632   325.0               0.0     0.0 184.0             0.0
1063.0
## 633   325.0               0.0     0.0 184.0             0.0
1063.0
## 634   275.0               0.0     0.0 183.0             0.0
1088.0
## 635   275.0               0.0     0.0 183.0             0.0
1088.0
## 636   300.0               0.0     0.0 184.0             0.0
1075.0
## 637   300.0               0.0     0.0 184.0             0.0
1075.0
## 638   375.0               0.0     0.0 186.0             0.0
1038.0
## 639   375.0               0.0     0.0 186.0             0.0
1038.0
## 640   400.0               0.0     0.0 187.0             0.0
1025.0
## 641   400.0               0.0     0.0 187.0             0.0
1025.0
## 642   250.0               0.0     0.0 182.0             0.0
1100.0
## 643   250.0               0.0     0.0 182.0             0.0
```

```
1100.0
## 644   350.0               0.0     0.0 186.0             0.0
1050.0
## 645   350.0               0.0     0.0 186.0             0.0
1050.0
## 649   141.3             212.0     0.0 203.5             0.0
971.8
## 650   166.8             250.2     0.0 203.5             0.0
975.6
## 652   183.9             122.6     0.0 203.5             0.0
959.2
## 655   122.6             183.9     0.0 203.5             0.0
958.2
## 656   166.8             250.2     0.0 203.5             0.0
975.6
## 657   200.0             133.0     0.0 192.0             0.0
965.4
## 658   108.3             162.4     0.0 203.5             0.0
938.2
## 659   305.3             203.5     0.0 203.5             0.0
965.4
## 662   141.3             212.0     0.0 203.5             0.0
971.8
## 663   157.0             236.0     0.0 192.0             0.0
935.4
## 664   133.0             200.0     0.0 192.0             0.0
927.4
## 665   250.2             166.8     0.0 203.5             0.0
977.6
## 666   173.0             116.0     0.0 192.0             0.0
946.8
## 667   192.0             288.0     0.0 192.0             0.0
929.8
## 668   192.0             288.0     0.0 192.0             0.0
929.8
## 670   288.0             192.0     0.0 192.0             0.0
932.0
## 671   305.3             203.5     0.0 203.5             0.0
965.4
## 672   236.0             157.0     0.0 192.0             0.0
972.6
## 673   173.0             116.0     0.0 192.0             0.0
946.8
## 674   212.0             141.3     0.0 203.5             0.0
973.4
## 675   236.0             157.0     0.0 192.0             0.0
972.6
## 677   166.8             250.2     0.0 203.5             0.0
975.6
## 679   288.0             192.0     0.0 192.0             0.0
```

```
932.0
## 680   212.0             141.3     0.0 203.5             0.0
973.4
## 682   173.0             116.0     0.0 192.0             0.0
946.8
## 683   183.9             122.6     0.0 203.5             0.0
959.2
## 686   133.0             200.0     0.0 192.0             0.0
927.4
## 687   305.3             203.5     0.0 203.5             0.0
965.4
## 689   108.3             162.4     0.0 203.5             0.0
938.2
## 690   157.0             236.0     0.0 192.0             0.0
935.4
## 691   288.0             192.0     0.0 192.0             0.0
932.0
## 692   212.0             141.3     0.0 203.5             0.0
973.4
## 695   236.0             157.0     0.0 192.0             0.0
972.6
## 696   116.0             173.0     0.0 192.0             0.0
909.8
## 697   183.9             122.6     0.0 203.5             0.0
959.2
## 698   108.3             162.4     0.0 203.5             0.0
938.2
## 701   133.0             200.0     0.0 192.0             0.0
927.4
## 703   200.0             133.0     0.0 192.0             0.0
965.4
## 704   200.0             133.0     0.0 192.0             0.0
965.4
## 705   250.2             166.8     0.0 203.5             0.0
977.6
## 706   122.6             183.9     0.0 203.5             0.0
958.2
## 709   116.0             173.0     0.0 192.0             0.0
909.8
## 711   250.2             166.8     0.0 203.5             0.0
977.6
## 713   192.0             288.0     0.0 192.0             0.0
929.8
## 714   157.0             236.0     0.0 192.0             0.0
935.4
## 717   116.0             173.0     0.0 192.0             0.0
909.8
## 718   141.3             212.0     0.0 203.5             0.0
971.8
## 719   122.6             183.9     0.0 203.5             0.0
```

```
958.2
## 722   310.0               0.0     0.0 192.0             0.0
1012.0
## 723   310.0               0.0     0.0 192.0             0.0
1012.0
## 724   310.0               0.0     0.0 192.0             0.0
1012.0
## 727   331.0               0.0     0.0 192.0             0.0
1025.0
## 728   331.0               0.0     0.0 192.0             0.0
1025.0
## 729   331.0               0.0     0.0 192.0             0.0
1025.0
## 732   349.0               0.0     0.0 192.0             0.0
1056.0
## 733   349.0               0.0     0.0 192.0             0.0
1056.0
## 734   349.0               0.0     0.0 192.0             0.0
1056.0
## 737   238.0               0.0     0.0 186.0             0.0
1119.0
## 738   238.0               0.0     0.0 186.0             0.0
1119.0
## 739   296.0               0.0     0.0 186.0             0.0
1090.0
## 740   296.0               0.0     0.0 186.0             0.0
1090.0
## 741   297.0               0.0     0.0 186.0             0.0
1040.0
## 742   480.0               0.0     0.0 192.0             0.0
936.0
## 744   397.0               0.0     0.0 186.0             0.0
1040.0
## 745   281.0               0.0     0.0 186.0             0.0
1104.0
## 746   281.0               0.0     0.0 185.0             0.0
1104.0
## 758   350.0               0.0     0.0 203.0             0.0
974.0
## 759   350.0               0.0     0.0 203.0             0.0
974.0
## 760   350.0               0.0     0.0 203.0             0.0
974.0
## 761   350.0               0.0     0.0 203.0             0.0
974.0
## 764   385.0               0.0     0.0 186.0             0.0
966.0
## 765   385.0               0.0     0.0 186.0             0.0
966.0
## 766   385.0               0.0     0.0 186.0             0.0
```

```
966.0
## 767   385.0               0.0     0.0 186.0             0.0
966.0
## 768   385.0               0.0     0.0 186.0             0.0
966.0
## 771   349.0               0.0     0.0 192.0             0.0
1047.0
## 772   331.0               0.0     0.0 192.0             0.0
978.0
## 773   382.0               0.0     0.0 186.0             0.0
1047.0
## 774   382.0               0.0     0.0 186.0             0.0
1047.0
## 775   382.0               0.0     0.0 186.0             0.0
1111.0
## 776   281.0               0.0     0.0 186.0             0.0
1104.0
## 777   339.0               0.0     0.0 185.0             0.0
1069.0
## 778   339.0               0.0     0.0 185.0             0.0
1069.0
## 779   295.0               0.0     0.0 185.0             0.0
1069.0
## 780   295.0               0.0     0.0 185.0             0.0
1069.0
## 781   238.0               0.0     0.0 185.0             0.0
1118.0
## 782   296.0               0.0     0.0 192.0             0.0
1085.0
## 783   296.0               0.0     0.0 192.0             0.0
1085.0
## 785   331.0               0.0     0.0 192.0             0.0
879.0
## 786   331.0               0.0     0.0 192.0             0.0
978.0
## 787   331.0               0.0     0.0 192.0             0.0
978.0
## 789   349.0               0.0     0.0 192.0             0.0
1047.0
## 790   349.0               0.0     0.0 192.0             0.0
1047.0
## 794   302.0               0.0     0.0 203.0             0.0
974.0
## 801   252.0               0.0     0.0 185.0             0.0
1111.0
## 802   252.0               0.0     0.0 185.0             0.0
1111.0
## 803   339.0               0.0     0.0 185.0             0.0
1060.0
## 804   393.0               0.0     0.0 192.0             0.0
```

```
940.0
## 805   393.0               0.0     0.0 192.0             0.0
940.0
## 807   382.0               0.0     0.0 185.0             0.0
1047.0
## 808   382.0               0.0     0.0 185.0             0.0
1047.0
## 809   252.0               0.0     0.0 186.0             0.0
1111.0
## 810   252.0               0.0     0.0 185.0             0.0
1111.0
## 811   310.0               0.0     0.0 192.0             0.0
970.0
## 812   310.0               0.0     0.0 192.0             0.0
970.0
## 822   322.0               0.0     0.0 203.0             0.0
974.0
## 823   322.0               0.0     0.0 203.0             0.0
974.0
## 825   302.0               0.0     0.0 203.0             0.0
974.0
## 826   397.0               0.0     0.0 185.0             0.0
1040.0
## 827   480.0               0.0     0.0 192.0             0.0
936.0
## 828   522.0               0.0     0.0 146.0             0.0
896.0
## 830   273.0             105.0    82.0 210.0             9.0
904.0
## 831   162.0             190.0   148.0 179.0            19.0
838.0
## 832   154.0             144.0   112.0 220.0            10.0
923.0
## 833   147.0             115.0    89.0 202.0             9.0
860.0
## 834   152.0             178.0   139.0 168.0            18.0
944.0
## 835   310.0             143.0   111.0 168.0            22.0
914.0
## 836   144.0               0.0   175.0 158.0            18.0
943.0
## 837   304.0             140.0     0.0 214.0             6.0
895.0
## 838   374.0               0.0     0.0 190.0             7.0
1013.0
## 839   159.0             149.0   116.0 175.0            15.0
953.0
## 840   153.0             239.0     0.0 200.0             6.0
1002.0
## 841   310.0             143.0     0.0 168.0            10.0
```

```
914.0
## 842   305.0               0.0   100.0 196.0            10.0
959.0
## 843   151.0               0.0   184.0 167.0            12.0
991.0
## 844   142.0             167.0   130.0 174.0            11.0
883.0
## 845   298.0             137.0   107.0 201.0             6.0
878.0
## 846   321.0             164.0     0.0 190.0             5.0
870.0
## 847   366.0             187.0     0.0 191.0             7.0
824.0
## 848   280.0             129.0   100.0 172.0             9.0
825.0
## 849   252.0              97.0    76.0 194.0             8.0
835.0
## 850   165.0               0.0   150.0 182.0            12.0
1023.0
## 851   156.0             243.0     0.0 180.0            11.0
1022.0
## 852   160.0             188.0   146.0 203.0            11.0
829.0
## 853   298.0               0.0   107.0 186.0             6.0
879.0
## 854   318.0               0.0   126.0 210.0             6.0
861.0
## 855   287.0             121.0    94.0 188.0             9.0
904.0
## 856   326.0             166.0     0.0 174.0             9.0
882.0
## 857   356.0               0.0   142.0 193.0            11.0
801.0
## 858   132.0             207.0   161.0 179.0             5.0
867.0
## 859   322.0             149.0     0.0 186.0             8.0
951.0
## 860   164.0               0.0   200.0 181.0            13.0
849.0
## 861   314.0               0.0   113.0 170.0            10.0
925.0
## 862   321.0               0.0   128.0 182.0            11.0
870.0
## 864   288.0             121.0     0.0 177.0             7.0
908.0
## 865   298.0               0.0   107.0 210.0            11.0
880.0
## 866   265.0             111.0    86.0 195.0             6.0
833.0
## 867   160.0             250.0     0.0 168.0            12.0
```

```
1049.0
## 868   166.0              260.0     0.0 183.0             13.0
859.0
## 869   276.0              116.0    90.0 180.0              9.0
870.0
## 870   322.0                0.0   116.0 196.0             10.0
818.0
## 871   149.0              139.0   109.0 193.0              6.0
892.0
## 872   159.0              187.0     0.0 176.0             11.0
990.0
## 873   261.0              100.0    78.0 201.0              9.0
864.0
## 875   313.0                0.0   113.0 178.0              8.0
1002.0
## 876   155.0              183.0     0.0 193.0              9.0
1047.0
## 877   146.0              230.0     0.0 202.0              3.0
827.0
## 878   296.0                0.0   107.0 221.0             11.0
819.0
## 879   133.0              210.0     0.0 196.0              3.0
949.0
## 880   313.0              145.0     0.0 178.0              8.0
867.0
## 881   152.0                0.0   112.0 184.0              8.0
992.0
## 882   153.0              145.0   113.0 178.0              8.0
1002.0
## 883   140.0              133.0   103.0 200.0              7.0
916.0
## 884   149.0              236.0     0.0 176.0             13.0
847.0
## 885   300.0                0.0   120.0 212.0             10.0
878.0
## 886   153.0              145.0   113.0 178.0              8.0
867.0
## 887   148.0                0.0   137.0 158.0             16.0
1002.0
## 888   326.0                0.0   138.0 199.0             11.0
801.0
## 889   153.0              145.0     0.0 178.0              8.0
1000.0
## 890   262.0              111.0    86.0 195.0              5.0
895.0
## 891   158.0                0.0   195.0 220.0             11.0
898.0
## 892   151.0                0.0   185.0 167.0             16.0
1074.0
## 893   273.0                0.0    90.0 199.0             11.0
```

```
931.0
## 894   149.0             118.0    92.0 183.0             7.0
953.0
## 895   143.0             169.0   143.0 191.0             8.0
967.0
## 896   260.0             101.0    78.0 171.0            10.0
936.0
## 897   313.0             161.0     0.0 178.0            10.0
917.0
## 898   284.0             120.0     0.0 168.0             7.0
970.0
## 899   336.0               0.0     0.0 182.0             3.0
986.0
## 900   145.0               0.0   134.0 181.0            11.0
979.0
## 901   150.0             237.0     0.0 174.0            12.0
1069.0
## 902   144.0             170.0   133.0 192.0             8.0
814.0
## 903   331.0             170.0     0.0 195.0             8.0
811.0
## 904   155.0               0.0   143.0 193.0             9.0
1047.0
## 905   155.0             183.0     0.0 193.0             9.0
877.0
## 906   135.0               0.0   166.0 180.0            10.0
961.0
## 907   266.0             112.0    87.0 178.0            10.0
910.0
## 908   314.0             145.0   113.0 179.0             8.0
869.0
## 909   313.0             145.0     0.0 127.0             8.0
1000.0
## 910   146.0             173.0     0.0 182.0             3.0
986.0
## 911   144.0             136.0   106.0 178.0             7.0
941.0
## 912   148.0               0.0   182.0 181.0            15.0
839.0
## 913   277.0             117.0    91.0 191.0             7.0
946.0
## 914   298.0               0.0   107.0 164.0            13.0
953.0
## 915   313.0             145.0     0.0 178.0             8.0
1002.0
## 916   155.0             184.0   143.0 194.0             9.0
880.0
## 917   289.0             134.0     0.0 195.0             6.0
924.0
## 918   148.0             175.0     0.0 171.0             2.0
```

```
1000.0
## 919   145.0               0.0   179.0 202.0             8.0
824.0
## 920   313.0               0.0     0.0 178.0             8.0
1000.0
## 921   136.0             162.0   126.0 172.0            10.0
923.0
## 922   155.0               0.0   143.0 193.0             9.0
877.0
## 923   255.0              99.0    77.0 189.0             6.0
919.0
## 924   162.0             207.0   172.0 216.0            10.0
822.0
## 925   136.0             196.0    98.0 199.0             6.0
847.0
## 926   164.0             163.0   128.0 197.0             8.0
961.0
## 927   162.0             214.0   164.0 202.0            10.0
820.0
## 928   157.0             214.0   152.0 200.0             9.0
819.0
## 930   135.0             105.0   193.0 196.0             6.0
965.0
## 931   159.0             209.0   161.0 201.0             7.0
848.0
## 932   144.0              15.0   195.0 176.0             6.0
1021.0
## 934   167.0             187.0   195.0 185.0             7.0
898.0
## 938   313.3               0.0   113.0 178.5             8.0
1001.9
## 939   154.8             183.4     0.0 193.3             9.1
1047.4
## 940   145.9             230.5     0.0 202.5             3.4
827.0
## 941   296.0               0.0   106.7 221.4            10.5
819.2
## 942   133.1             210.2     0.0 195.7             3.1
949.4
## 943   313.3             145.0     0.0 178.5             8.0
867.2
## 944   151.6               0.0   111.9 184.4             7.9
992.0
## 945   153.1             145.0   113.0 178.5             8.0
1001.9
## 946   139.9             132.6   103.3 200.3             7.4
916.0
## 947   149.5             236.0     0.0 175.8            12.6
846.8
## 948   299.8               0.0   119.8 211.5             9.9
```

```
878.2
## 949   153.1             145.0   113.0 178.5             8.0
867.2
## 950   148.1               0.0   136.6 158.1            16.1
1001.8
## 951   326.5               0.0   137.9 199.0            10.8
801.1
## 952   152.7             144.7     0.0 178.1             8.0
999.7
## 953   261.9             110.5    86.1 195.4             5.0
895.2
## 954   158.4               0.0   194.9 219.7            11.0
897.7
## 955   150.7               0.0   185.3 166.7            15.6
1074.5
## 956   272.6               0.0    89.6 198.7            10.6
931.3
## 957   149.0             117.6    91.7 182.9             7.1
953.4
## 958   143.0             169.4   142.7 190.7             8.4
967.4
## 959   259.9             100.6    78.4 170.6            10.4
935.7
## 960   312.9             160.5     0.0 177.6             9.6
916.6
## 961   284.0             119.7     0.0 168.3             7.2
970.4
## 962   336.5               0.0     0.0 181.9             3.4
985.8
## 963   144.8               0.0   133.6 180.8            11.1
979.5
## 964   150.0             236.8     0.0 173.8            11.9
1069.3
## 965   143.7             170.2   132.6 191.6             8.5
814.1
## 966   330.5             169.6     0.0 194.9             8.1
811.0
## 967   154.8               0.0   142.8 193.3             9.1
1047.4
## 968   154.8             183.4     0.0 193.3             9.1
877.2
## 969   134.7               0.0   165.7 180.2            10.0
961.0
## 970   266.2             112.3    87.5 177.9            10.4
909.7
## 971   314.0             145.3   113.2 178.9             8.0
869.1
## 972   312.7             144.7     0.0 127.3             8.0
999.7
## 973   145.7             172.6     0.0 181.9             3.4
```

```
985.8
## 974   143.8             136.3   106.2 178.1             7.5
941.5
## 975   148.1               0.0   182.1 181.4            15.0
838.9
## 976   277.0             116.8    91.0 190.6             7.0
946.5
## 977   298.1               0.0   107.5 163.6            12.8
953.2
## 978   313.3             145.0     0.0 178.5             8.0
1001.9
## 979   155.2             183.9   143.2 193.8             9.2
879.6
## 980   289.0             133.7     0.0 194.9             5.5
924.1
## 981   147.8             175.1     0.0 171.2             2.2
1000.0
## 982   145.4               0.0   178.9 201.7             7.8
824.0
## 983   312.7               0.0     0.0 178.1             8.0
999.7
## 984   136.4             161.6   125.8 171.6            10.4
922.6
## 985   154.8               0.0   142.8 193.3             9.1
877.2
## 986   255.3              98.8    77.0 188.6             6.5
919.0
## 987   272.8             105.1    81.8 209.7             9.0
904.0
## 988   162.0             190.1   148.1 178.8            18.8
838.1
## 989   153.6             144.2   112.3 220.1            10.1
923.2
## 990   146.5             114.6    89.3 201.9             8.8
860.0
## 991   151.8             178.1   138.7 167.5            18.3
944.0
## 992   309.9             142.8   111.2 167.8            22.1
913.9
## 993   143.6               0.0   174.9 158.4            17.9
942.7
## 994   303.6             139.9     0.0 213.5             6.2
895.5
## 995   374.3               0.0     0.0 190.2             6.7
1013.2
## 996   158.6             148.9   116.0 175.1            15.0
953.3
## 997   152.6             238.7     0.0 200.0             6.3
1001.8
## 998   310.0             142.8     0.0 167.9            10.0
```

```
914.3
## 999   304.8               0.0    99.6 196.0             9.8
959.4
## 1000  150.9               0.0   183.9 166.6            11.6
991.2
## 1001  141.9             166.6   129.7 173.5            10.9
882.6
## 1002  297.8             137.2   106.9 201.3             6.0
878.4
## 1003  321.3             164.2     0.0 190.5             4.6
870.0
## 1004  366.0             187.0     0.0 191.3             6.6
824.3
## 1005  279.8             128.9   100.4 172.4             9.5
825.1
## 1006  252.1              97.1    75.6 193.8             8.3
835.5
## 1007  164.6               0.0   150.4 181.6            11.7
1023.3
## 1008  155.6             243.5     0.0 180.3            10.7
1022.0
## 1009  160.2             188.0   146.4 203.2            11.3
828.7
## 1010  298.1               0.0   107.0 186.4             6.1
879.0
## 1011  317.9               0.0   126.5 209.7             5.7
860.5
## 1012  287.3             120.5    93.9 187.6             9.2
904.4
## 1013  325.6             166.4     0.0 174.0             8.9
881.6
## 1014  355.9               0.0   141.6 193.3            11.0
801.4
## 1015  132.0             206.5   160.9 178.9             5.5
866.9
## 1016  322.5             148.6     0.0 185.8             8.5
951.0
## 1017  164.2               0.0   200.1 181.2            12.6
849.3
## 1018  313.8               0.0   112.6 169.9            10.1
925.3
## 1019  321.4               0.0   127.9 182.5            11.5
870.1
## 1021  288.4             121.0     0.0 177.4             7.0
907.9
## 1022  298.2               0.0   107.0 209.7            11.1
879.6
## 1023  264.5             111.0    86.5 195.5             5.9
832.6
## 1024  159.8             250.0     0.0 168.4            12.2
```

```
1049.3
## 1025  166.0              259.7     0.0 183.2             12.7
858.8
## 1026  276.4              116.0    90.3 179.6              8.9
870.1
## 1027  322.2                0.0   115.6 196.0             10.4
817.9
## 1028  148.5              139.4   108.6 192.7              6.1
892.4
## 1029  159.1              186.7     0.0 175.6             11.3
989.6
## 1030  260.9              100.5    78.3 200.6              8.6
864.5
##      Fine_Aggregate Age_day Concrete_compressive_strength
## 2             676.0      28                         61.89
## 9             670.0      28                         45.85
## 12            825.5      28                         28.02
## 15            670.0      28                         47.81
## 22            806.9      28                         28.24
## 23            806.9       3                          8.06
## 47            806.9       3                         15.05
## 55            806.9       7                         14.59
## 56            825.5       7                         14.64
## 58            825.5       3                          9.13
## 63            850.6       3                          9.87
## 69            670.0      28                         40.86
## 70            800.0      28                         71.99
## 71            756.7       3                         34.40
## 73            887.1       3                         33.40
## 74            803.7       3                         36.30
## 76            781.5       3                         37.80
## 78            887.1       3                         33.40
## 79            925.7       3                         28.10
## 81            887.1       3                         33.40
## 82            880.4       3                         25.20
## 83            852.1       3                         41.10
## 84            755.8       3                         35.30
## 85            659.9       3                         28.30
## 87            755.8       3                         35.30
## 88            803.7       3                         24.40
## 89            755.8       3                         35.30
## 90            707.9       3                         39.30
## 91            755.8       3                         40.60
## 92            755.8       3                         35.30
## 93            755.8       3                         24.10
## 94            756.7       7                         46.20
## 96            887.1       7                         49.20
## 97            803.7       7                         46.80
## 99            781.5       7                         55.60
## 101           887.1       7                         49.20
```

```
## 102          925.7       7                    34.90
## 104          887.1       7                    49.20
## 105          880.4       7                    33.40
## 106          852.1       7                    54.10
## 107          755.8       7                    55.90
## 108          659.9       7                    49.80
## 110          755.8       7                    55.90
## 111          803.7       7                    38.00
## 112          755.8       7                    55.90
## 113          707.9       7                    56.10
## 114          755.8       7                    59.09
## 115          755.8       7                    22.90
## 116          755.8       7                    35.10
## 117          756.7      28                    61.09
## 119          887.1      28                    60.29
## 120          803.7      28                    61.80
## 122          781.5      28                    68.30
## 124          887.1      28                    60.29
## 125          925.7      28                    50.70
## 127          887.1      28                    60.29
## 128          880.4      28                    55.50
## 129          852.1      28                    68.50
## 130          755.8      28                    71.30
## 133          755.8      28                    71.30
## 134          803.7      28                    67.70
## 135          755.8      28                    71.30
## 136          707.9      28                    66.00
## 138          755.8      28                    71.30
## 139          755.8      28                    49.90
## 140          756.7      56                    63.40
## 142          887.1      56                    64.30
## 143          803.7      56                    64.90
## 145          781.5      56                    72.30
## 147          887.1      56                    64.30
## 148          925.7      56                    55.20
## 150          887.1      56                    64.30
## 151          880.4      56                    66.10
## 157          803.7      56                    72.99
## 159          707.9      56                    71.70
## 162          755.8      56                    59.89
## 185          870.3       3                    11.58
## 186          870.3      14                    24.45
## 187          870.3      28                    24.89
## 188          870.3      56                    29.45
## 190          852.2       3                    10.38
## 191          852.2      14                    22.14
## 192          852.2      28                    22.84
## 193          852.2      56                    27.66
## 195          905.9       3                    12.45
## 196          905.9      14                    24.99
```

```
## 197          905.9     28                      25.72
## 198          905.9     56                      33.96
## 200          804.0      3                      15.04
## 201          804.0     14                      21.06
## 202          804.0     28                      26.40
## 203          804.0     56                      35.34
## 205          779.3      3                      12.47
## 206          779.3     14                      20.92
## 207          779.3     28                      24.90
## 208          779.3     56                      34.20
## 210          758.6      3                      10.03
## 211          758.6     14                      20.08
## 212          758.6     28                      24.48
## 213          758.6     56                      31.54
## 215          802.6      3                       9.45
## 216          802.6     14                      22.72
## 217          802.6     28                      28.47
## 218          802.6     56                      38.56
## 220          780.1      3                      10.76
## 221          780.1     14                      25.48
## 222          780.1     28                      21.54
## 223          780.1     56                      28.63
## 230          785.4      3                      18.00
## 231          785.4     14                      30.39
## 232          785.4     28                      45.71
## 233          785.4     56                      50.77
## 235          785.5      3                      13.18
## 236          785.5     14                      17.84
## 237          785.5     28                      40.23
## 238          785.5     56                      47.13
## 240          757.6      3                      13.36
## 241          757.6     14                      22.32
## 242          757.6     28                      24.54
## 243          757.6     56                      31.35
## 245          847.0      3                      19.93
## 246          847.0     14                      25.69
## 247          847.0     28                      30.23
## 248          847.0     56                      39.59
## 250          861.2      3                      13.82
## 251          861.2     14                      24.92
## 252          861.2     28                      29.22
## 253          861.2     56                      38.33
## 255          903.6      3                      13.54
## 256          903.6     14                      26.31
## 257          903.6     28                      31.64
## 258          903.6     56                      42.55
## 260          903.8      3                      13.33
## 261          903.8     14                      25.37
## 262          903.8     28                      37.40
## 263          903.8     56                      44.40
```

```
## 265          799.5       3                    19.52
## 266          799.5      14                    31.35
## 267          799.5      28                    38.50
## 268          799.5      56                    45.08
## 270          778.5       3                    15.44
## 271          778.5      14                    26.77
## 272          778.5      28                    33.73
## 273          778.5      56                    42.70
## 275          757.7       3                    17.22
## 276          757.7      14                    29.93
## 277          757.7      28                    29.65
## 278          757.7      56                    36.97
## 280          757.7       3                    13.12
## 281          757.7      14                    24.43
## 282          757.7      28                    32.66
## 283          757.7      56                    36.64
## 285          777.8       3                    13.62
## 286          777.8      14                    21.60
## 287          777.8      28                    27.77
## 288          777.8      56                    35.57
## 290          780.7       3                     7.32
## 291          780.7      14                    21.50
## 292          780.7      28                    31.27
## 293          780.7      56                    43.50
## 295          796.2       3                     7.40
## 296          796.2      14                    23.51
## 297          796.2      28                    31.12
## 298          796.2      56                    39.15
## 300          865.0       3                    22.50
## 301          865.0      14                    34.67
## 302          865.0      28                    34.74
## 303          865.0      56                    45.08
## 305          875.6       3                    23.14
## 306          875.6      14                    41.89
## 307          875.6      28                    48.28
## 308          875.6      56                    51.04
## 310          859.2       3                    22.95
## 311          859.2      14                    35.23
## 312          859.2      28                    39.94
## 313          859.2      56                    48.72
## 315          899.8       3                    21.02
## 316          899.8      14                    33.36
## 317          899.8      28                    33.94
## 318          899.8      56                    44.14
## 320          889.0       3                    15.36
## 321          889.0      14                    28.68
## 322          889.0      28                    30.85
## 323          889.0      56                    42.03
## 325          889.0       3                    21.78
## 326          889.0      14                    42.29
```

```
## 327          889.0     28                    50.60
## 328          889.0     56                    55.83
## 330          800.9      3                    23.52
## 331          800.9     14                    42.22
## 332          800.9     28                    52.50
## 333          800.9     56                    60.32
## 335          777.5      3                    23.80
## 336          777.5     14                    38.77
## 337          777.5     28                    51.33
## 338          777.5     56                    56.85
## 340          753.5      3                    21.91
## 341          753.5     14                    36.99
## 342          753.5     28                    47.40
## 343          753.5     56                    51.96
## 345          776.4      3                    17.57
## 346          776.4     14                    33.73
## 347          776.4     28                    40.15
## 348          776.4     56                    46.64
## 350          775.5      3                    17.37
## 351          775.5     14                    33.70
## 352          775.5     28                    45.94
## 353          775.5     56                    51.43
## 355          782.5      3                    30.45
## 356          782.5     14                    47.71
## 357          782.5     28                    63.14
## 358          782.5     56                    66.82
## 360          792.7      3                    27.42
## 361          792.7     14                    35.96
## 362          792.7     28                    55.51
## 363          792.7     56                    61.99
## 365          780.6      3                    18.02
## 366          780.6     14                    38.60
## 367          780.6     28                    52.20
## 368          780.6     56                    53.96
## 370          794.9      3                    15.34
## 371          794.9     14                    26.05
## 372          794.9     28                    30.22
## 373          794.9     56                    37.27
## 375          762.4      3                    16.28
## 376          762.4     14                    25.62
## 377          762.4     28                    31.97
## 378          762.4     56                    36.30
## 380          853.0     28                    67.57
## 381          641.0     28                    57.23
## 385          802.0     28                    41.37
## 386          855.0     28                    60.28
## 387          720.0     28                    56.83
## 388          805.0     28                    51.02
## 389          768.0     28                    55.55
## 392          633.0     28                    55.65
```

```
## 393          652.0      28                    47.28
## 394          633.0      28                    44.33
## 395          695.0      28                    52.30
## 396          660.0      28                    49.25
## 397          802.0      28                    41.37
## 398          880.0      28                    29.16
## 399          879.0      28                    39.40
## 400          760.0      28                    39.30
## 401          800.0      28                    67.87
## 402          662.0      28                    58.52
## 403          685.0      28                    53.58
## 404          657.0      28                    59.00
## 406          655.0      28                    69.84
## 407          900.9       3                    14.40
## 408          746.6       3                    19.42
## 409          746.8       3                    20.73
## 410          746.6       3                    14.94
## 411          856.4       3                    21.29
## 412          793.5       3                    23.08
## 413          770.1       3                    15.52
## 414          746.6       3                    15.82
## 415          798.9       3                    12.55
## 416          857.2       3                     8.49
## 417          771.9       3                    15.61
## 418          901.8       3                    12.18
## 419          754.3       3                    11.98
## 420          900.9      14                    16.88
## 421          746.6      14                    33.09
## 422          746.8      14                    34.24
## 423          746.6      14                    31.81
## 424          856.4      14                    29.75
## 425          793.5      14                    33.01
## 426          770.1      14                    32.90
## 427          746.6      14                    29.55
## 428          798.9      14                    19.42
## 429          857.2      14                    24.66
## 430          771.9      14                    29.59
## 431          901.8      14                    24.28
## 432          754.3      14                    20.73
## 433          900.9      28                    26.20
## 434          746.6      28                    46.39
## 435          746.8      28                    39.16
## 436          746.6      28                    41.20
## 437          856.4      28                    33.69
## 438          793.5      28                    38.20
## 439          770.1      28                    41.41
## 440          746.6      28                    37.81
## 441          798.9      28                    24.85
## 442          857.2      28                    27.22
## 443          771.9      28                    44.64
```

```
## 444          901.8      28                    37.27
## 445          754.3      28                    33.27
## 446          900.9      56                    36.56
## 447          746.6      56                    53.72
## 448          746.8      56                    48.59
## 449          746.6      56                    51.72
## 450          856.4      56                    35.85
## 451          793.5      56                    53.77
## 452          770.1      56                    53.46
## 453          746.6      56                    48.99
## 454          798.9      56                    31.72
## 455          857.2      56                    39.64
## 456          771.9      56                    51.26
## 457          901.8      56                    43.39
## 458          754.3      56                    39.27
## 472          712.0      28                    57.03
## 473          712.0      28                    44.42
## 474          712.0      28                    51.02
## 475          712.0      28                    53.39
## 476          712.0       3                    35.36
## 477          712.0       3                    25.02
## 478          712.0       3                    23.35
## 479          712.0       7                    52.01
## 480          712.0       7                    38.02
## 481          712.0       7                    39.30
## 482          712.0      56                    61.07
## 483          712.0      56                    56.14
## 484          712.0      56                    55.25
## 485          712.0      56                    54.77
## 486          845.0      28                    50.24
## 487          845.0      28                    46.68
## 488          845.0      28                    46.68
## 489          845.0       3                    22.75
## 490          845.0       3                    25.51
## 491          845.0       3                    34.77
## 492          845.0       7                    36.84
## 493          845.0       7                    45.90
## 494          845.0       7                    41.67
## 495          845.0      56                    56.34
## 496          845.0      56                    47.97
## 497          845.0      56                    61.46
## 498          871.0      28                    44.03
## 499          871.0      28                    55.45
## 500          699.0      28                    55.55
## 501          699.0      28                    57.92
## 502          699.0       3                    25.61
## 503          699.0       7                    33.49
## 504          699.0      56                    59.59
## 505          699.0       3                    29.55
## 506          699.0       7                    37.92
```

```
## 507          699.0     56                    61.86
## 508          750.0     28                    62.05
## 509          750.0      3                    32.01
## 510          750.0     28                    72.10
## 511          750.0      7                    39.00
## 512          750.0     56                    65.70
## 513          750.0      3                    32.11
## 514          750.0      7                    40.29
## 516          801.0     28                    21.97
## 517          801.0      3                     9.85
## 518          801.0      7                    15.07
## 519          801.0     56                    23.25
## 520          801.0     28                    43.73
## 521          801.0      3                    13.40
## 522          801.0      7                    24.13
## 523          801.0     56                    44.52
## 524          801.0     28                    62.94
## 525          801.0     28                    59.49
## 526          801.0      3                    25.12
## 527          801.0      3                    23.64
## 528          801.0      7                    35.75
## 529          801.0      7                    38.61
## 530          801.0     56                    68.75
## 531          801.0     56                    66.78
## 532          719.7     28                    23.85
## 534          895.3      3                    11.65
## 535          785.6      3                    19.20
## 537          785.6     28                    39.60
## 538          712.2     28                    43.94
## 539          712.2      7                    34.57
## 541          712.2      3                    24.40
## 542          842.6      3                    15.62
## 545          895.3      7                    14.60
## 547          842.6     28                    31.97
## 548          842.6      7                    23.40
## 549          895.3     28                    25.57
## 551          785.6      7                    27.74
## 553          734.3      7                     9.62
## 555          734.3      7                    15.69
## 556          714.3     28                    27.94
## 557          704.3     28                    32.63
## 558          724.3      7                    17.24
## 559          714.3      7                    19.77
## 561          744.3     28                    25.75
## 562          734.3     28                    33.08
## 563          739.3      7                    24.07
## 564          689.3      7                    21.82
## 565          734.3     28                    21.07
## 566          769.3      7                    14.84
## 567          724.3     28                    32.05
```

```
## 568          759.3       7                    11.96
## 569          734.3       7                    25.45
## 570          784.3      28                    22.49
## 571          769.3      28                    25.22
## 572          674.3      28                    39.70
## 573          744.3       7                    13.09
## 574          689.3      28                    38.70
## 575          759.3       7                     7.51
## 576          789.3      28                    17.58
## 577          754.3       7                    21.18
## 578          759.3      28                    18.20
## 579          704.3       7                    17.20
## 580          759.3      28                    22.63
## 581          704.3       7                    21.86
## 582          714.3       7                    12.37
## 583          724.3      28                    25.73
## 584          689.3      28                    37.81
## 585          674.3       7                    21.92
## 586          704.3      28                    33.04
## 587          784.3       7                    14.54
## 588          734.3      28                    26.91
## 589          764.3       7                     8.00
## 590          754.3      28                    31.90
## 591          789.3       7                    10.34
## 592          784.3      28                    19.77
## 593          739.3      28                    37.44
## 594          784.3       7                    11.48
## 595          689.3       7                    24.44
## 596          764.3      28                    17.60
## 597          724.3       7                    10.73
## 598          714.3      28                    31.38
## 599          781.0       3                    13.22
## 600          781.0       7                    20.97
## 601          781.0      14                    27.04
## 602          781.0      28                    32.04
## 606          885.0       3                     6.47
## 607          885.0      14                    12.84
## 608          885.0      28                    18.42
## 612          856.0      14                    21.26
## 613          856.0      28                    25.97
## 614          856.0       3                    11.36
## 618          863.0       3                     9.31
## 624          812.0       3                    12.54
## 625          812.0      28                    27.53
## 627          885.0       7                     9.99
## 628          845.0       7                     7.84
## 629          845.0      28                    12.25
## 630          833.0       7                    11.17
## 631          833.0      28                    17.34
## 632          783.0       7                    17.54
```

```
## 633          783.0      28                       30.57
## 634          808.0       7                       14.20
## 635          808.0      28                       24.50
## 636          795.0       7                       15.58
## 637          795.0      28                       26.85
## 638          758.0       7                       26.06
## 639          758.0      28                       38.21
## 640          745.0      28                       43.70
## 641          745.0       7                       30.14
## 642          820.0       7                       12.73
## 643          820.0      28                       20.87
## 644          770.0       7                       20.28
## 645          770.0      28                       34.29
## 649          748.5      28                       29.89
## 650          692.6       3                        6.90
## 652          800.0       3                        4.90
## 655          800.1      28                       24.29
## 656          692.6      28                       33.95
## 657          806.2       3                       11.41
## 658          849.0      28                       20.59
## 659          631.0       7                       25.89
## 662          748.5       7                       10.39
## 663          781.2      28                       33.66
## 664          839.2      28                       27.87
## 665          694.1       7                       19.35
## 666          856.8       7                       11.39
## 667          716.1       3                       12.79
## 668          716.1      28                       39.32
## 670          717.8       3                       16.11
## 671          631.0      28                       43.38
## 672          749.1       7                       20.42
## 673          856.8       3                        6.94
## 674          750.0       7                       15.03
## 675          749.1       3                       13.57
## 677          692.6       7                       15.75
## 679          717.8      28                       38.80
## 680          750.0      28                       33.00
## 682          856.8      28                       24.28
## 683          800.0      28                       24.05
## 686          839.2       7                       13.66
## 687          631.0       3                       14.14
## 689          849.0       3                        2.33
## 690          781.2       7                       16.89
## 691          717.8       7                       23.52
## 692          750.0       3                        6.81
## 695          749.1      28                       32.88
## 696          891.9      28                       22.35
## 697          800.0       7                       10.79
## 698          849.0       7                        7.72
## 701          839.2       3                        6.88
```

```
## 703          806.2       7                    17.17
## 704          806.2      28                    30.44
## 705          694.1       3                     9.73
## 706          800.1       3                     3.32
## 709          891.9       3                     6.28
## 711          694.1      28                    36.96
## 713          716.1       7                    21.48
## 714          781.2       3                     9.69
## 717          891.9       7                    10.09
## 718          748.5       3                     4.83
## 719          800.1       7                    10.35
## 722          830.0       3                    11.85
## 723          830.0       7                    17.24
## 724          830.0      28                    27.83
## 727          821.0       3                    14.31
## 728          821.0       7                    17.44
## 729          821.0      28                    31.74
## 732          809.0       3                    15.87
## 733          809.0       7                     9.01
## 734          809.0      28                    33.61
## 737          789.0       7                    12.05
## 738          789.0      28                    17.54
## 739          769.0       7                    18.91
## 740          769.0      28                    25.18
## 741          734.0       7                    30.96
## 742          721.0      28                    43.89
## 744          734.0      28                    36.94
## 745          774.0       7                    14.50
## 746          774.0      28                    22.44
## 758          775.0       7                    18.13
## 759          775.0      14                    22.53
## 760          775.0      28                    27.34
## 761          775.0      56                    29.98
## 764          763.0       1                     6.27
## 765          763.0       3                    14.70
## 766          763.0       7                    23.22
## 767          763.0      14                    27.92
## 768          763.0      28                    31.35
## 771          806.0       3                    14.99
## 772          825.0       3                    13.52
## 773          739.0       7                    24.00
## 774          739.0      28                    37.42
## 775          784.0       7                    11.47
## 776          774.0      28                    22.44
## 777          754.0       7                    21.16
## 778          754.0      28                    31.84
## 779          769.0       7                    14.80
## 780          769.0      28                    25.18
## 781          789.0      28                    17.54
## 782          765.0       7                    14.20
```

```
## 783          765.0      28                      21.65
## 785          825.0       3                      13.52
## 786          825.0       7                      16.26
## 787          825.0      28                      31.45
## 789          806.0       7                      18.13
## 790          806.0      28                      32.72
## 794          817.0      14                      18.13
## 801          784.0       7                      13.71
## 802          784.0      28                      19.69
## 803          754.0      28                      31.65
## 804          758.0       3                      19.11
## 805          758.0      28                      39.58
## 807          739.0       7                      24.00
## 808          739.0      28                      37.42
## 809          784.0       7                      11.47
## 810          784.0      28                      19.69
## 811          850.0       7                      14.99
## 812          850.0      28                      27.92
## 822          800.0      14                      20.77
## 823          800.0      28                      25.18
## 825          817.0      28                      21.75
## 826          734.0      28                      39.09
## 827          721.0       3                      24.39
## 828          896.0       7                      50.51
## 830          680.0      28                      37.17
## 831          741.0      28                      33.76
## 832          658.0      28                      16.50
## 833          829.0      28                      19.99
## 834          695.0      28                      36.35
## 835          651.0      28                      33.69
## 836          844.0      28                      15.42
## 837          722.0      28                      33.42
## 838          730.0      28                      39.05
## 839          720.0      28                      27.68
## 840          684.0      28                      26.86
## 841          804.0      28                      45.30
## 842          705.0      28                      30.12
## 843          772.0      28                      15.57
## 844          785.0      28                      44.61
## 845          655.0      28                      53.52
## 846          774.0      28                      57.21
## 847          757.0      28                      65.91
## 848          805.0      28                      52.82
## 849          821.0      28                      33.40
## 850          729.0      28                      18.03
## 851          698.0      28                      37.36
## 852          710.0      28                      32.84
## 853          815.0      28                      42.64
## 854          737.0      28                      40.06
## 855          696.0      28                      41.94
```

```
## 856          790.0     28                    61.23
## 857          778.0     28                    40.87
## 858          736.0     28                    33.30
## 859          709.0     28                    52.42
## 860          846.0     28                    15.09
## 861          783.0     28                    38.46
## 862          780.0     28                    37.26
## 864          829.0     28                    42.13
## 865          744.0     28                    31.87
## 866          790.0     28                    41.54
## 867          688.0     28                    39.45
## 868          827.0     28                    37.91
## 869          768.0     28                    44.28
## 870          813.0     28                    31.18
## 871          780.0     28                    23.69
## 872          789.0     28                    32.76
## 873          761.0     28                    32.40
## 875          689.0     28                    36.80
## 876          697.0     28                    18.28
## 877          872.0     28                    33.06
## 878          778.0     28                    31.42
## 879          795.0     28                    31.03
## 880          824.0     28                    44.39
## 881          816.0     28                    12.18
## 882          689.0     28                    25.56
## 883          753.0     28                    36.44
## 884          893.0     28                    32.96
## 885          728.0     28                    23.84
## 886          824.0     28                    26.23
## 887          830.0     28                    17.95
## 888          792.0     28                    40.68
## 889          822.0     28                    19.01
## 890          733.0     28                    33.72
## 891          713.0     28                     8.54
## 892          678.0     28                    13.46
## 893          762.0     28                    32.24
## 894          780.0     28                    23.52
## 895          643.0     28                    29.72
## 896          763.0     28                    49.77
## 897          759.0     28                    52.44
## 898          794.0     28                    40.93
## 899          817.0     28                    44.86
## 900          812.0     28                    13.20
## 901          675.0     28                    37.43
## 902          805.0     28                    29.87
## 903          802.0     28                    56.61
## 904          697.0     28                    12.46
## 905          868.0     28                    23.79
## 906          805.0     28                    13.29
## 907          745.0     28                    39.42
```

```
## 908          690.0     28                    46.23
## 909          822.0     28                    44.52
## 910          817.0     28                    23.74
## 911          774.0     28                    26.14
## 912          884.0     28                    15.52
## 913          666.0     28                    43.57
## 914          784.0     28                    35.86
## 915          689.0     28                    41.05
## 916          699.0     28                    28.99
## 917          760.0     28                    46.24
## 918          828.0     28                    26.92
## 919          869.0     28                    10.54
## 920          822.0     28                    25.10
## 921          764.0     28                    29.07
## 922          868.0     28                     9.74
## 923          749.0     28                    33.80
## 924          638.0     28                    39.84
## 925          783.0     28                    26.97
## 926          641.0     28                    27.23
## 927          680.0     28                    30.65
## 928          704.0     28                    33.05
## 930          643.0     28                    21.91
## 931          669.0     28                    30.88
## 932          709.0     28                    15.34
## 934          636.0     28                    23.89
## 938          688.7     28                    36.80
## 939          696.7     28                    18.29
## 940          871.8     28                    32.72
## 941          778.4     28                    31.42
## 942          795.3     28                    28.94
## 943          824.0     28                    40.93
## 944          815.9     28                    12.18
## 945          688.7     28                    25.56
## 946          753.4     28                    36.44
## 947          892.7     28                    32.96
## 948          727.6     28                    23.84
## 949          824.0     28                    26.23
## 950          830.1     28                    17.96
## 951          792.5     28                    38.63
## 952          822.2     28                    19.01
## 953          732.6     28                    33.72
## 954          712.9     28                     8.54
## 955          678.0     28                    13.46
## 956          762.2     28                    32.25
## 957          780.3     28                    23.52
## 958          643.5     28                    29.73
## 959          762.9     28                    49.77
## 960          759.5     28                    52.45
## 961          794.2     28                    40.93
## 962          816.8     28                    44.87
```

```
## 963          811.5     28                    13.20
## 964          674.8     28                    37.43
## 965          805.3     28                    29.87
## 966          802.3     28                    56.62
## 967          696.7     28                    12.46
## 968          867.7     28                    23.79
## 969          804.9     28                    13.29
## 970          744.5     28                    39.42
## 971          690.2     28                    46.23
## 972          822.2     28                    44.52
## 973          816.8     28                    23.74
## 974          774.3     28                    26.15
## 975          884.3     28                    15.53
## 976          665.6     28                    43.58
## 977          784.0     28                    35.87
## 978          688.7     28                    41.05
## 979          698.5     28                    28.99
## 980          760.1     28                    46.25
## 981          828.5     28                    26.92
## 982          868.7     28                    10.54
## 983          822.2     28                    25.10
## 984          764.4     28                    29.07
## 985          867.7     28                     9.74
## 986          749.3     28                    33.80
## 987          679.7     28                    37.17
## 988          741.4     28                    33.76
## 989          657.9     28                    16.50
## 990          829.5     28                    19.99
## 991          694.6     28                    36.35
## 992          651.2     28                    38.22
## 993          844.5     28                    15.42
## 994          722.5     28                    33.42
## 995          730.4     28                    39.06
## 996          719.7     28                    27.68
## 997          683.9     28                    26.86
## 998          804.0     28                    45.30
## 999          705.2     28                    30.12
## 1000         772.2     28                    15.57
## 1001         785.3     28                    44.61
## 1002         655.3     28                    53.52
## 1003         774.0     28                    57.22
## 1004         756.9     28                    65.91
## 1005         804.9     28                    52.83
## 1006         821.4     28                    33.40
## 1007         728.9     28                    18.03
## 1008         697.7     28                    37.36
## 1009         709.7     28                    35.31
## 1010         815.2     28                    42.64
## 1011         736.6     28                    40.06
## 1012         695.9     28                    43.80
```

```
## 1013          790.0      28                          61.24
## 1014          778.4      28                          40.87
## 1015          735.6      28                          33.31
## 1016          709.5      28                          52.43
## 1017          846.0      28                          15.09
## 1018          782.9      28                          38.46
## 1019          779.7      28                          37.27
## 1021          829.5      28                          42.14
## 1022          744.2      28                          31.88
## 1023          790.4      28                          41.54
## 1024          688.2      28                          39.46
## 1025          826.8      28                          37.92
## 1026          768.3      28                          44.28
## 1027          813.4      28                          31.18
## 1028          780.0      28                          23.70
## 1029          788.9      28                          32.77
## 1030          761.5      28                          32.40
```

```
cleaned_data<-remove_outlier(cleaned_data_2,
c('Cement','Blast_Furnace_Slag','Fly_Ash','Water','Superplasticizer','Coarse_
Aggregate','Fine_Aggregate','Age_day','Concrete_compressive_strength'))
```

```
## [1] "Remove outliers"
##      Cement Blast_Furnace_Slag Fly_Ash Water Superplasticizer
Coarse_Aggregate
## 2     540.0               0.0     0.0 162.0              2.5
1055.0
## 9     266.0             114.0     0.0 228.0              0.0
932.0
## 12    198.6             132.4     0.0 192.0              0.0
978.4
## 15    304.0              76.0     0.0 228.0              0.0
932.0
## 22    139.6             209.4     0.0 192.0              0.0
1047.0
## 23    139.6             209.4     0.0 192.0              0.0
1047.0
## 47    349.0               0.0     0.0 192.0              0.0
1047.0
## 55    139.6             209.4     0.0 192.0              0.0
1047.0
## 56    198.6             132.4     0.0 192.0              0.0
978.4
## 58    198.6             132.4     0.0 192.0              0.0
978.4
## 63    310.0               0.0     0.0 192.0              0.0
971.0
## 69    190.0             190.0     0.0 228.0              0.0
932.0
## 71    374.0             189.2     0.0 170.1             10.1
```

```
926.1
## 73    425.0             106.3     0.0 153.5             16.5
852.1
## 74    425.0             106.3     0.0 151.4             18.6
936.0
## 76    475.0             118.8     0.0 181.1              8.9
852.1
## 78    425.0             106.3     0.0 153.5             16.5
852.1
## 79    388.6              97.1     0.0 157.9             12.1
852.1
## 81    425.0             106.3     0.0 153.5             16.5
852.1
## 82    318.8             212.5     0.0 155.7             14.3
852.1
## 83    401.8              94.7     0.0 147.4             11.4
946.8
## 84    362.6             189.0     0.0 164.9             11.6
944.7
## 85    323.7             282.8     0.0 183.8             10.3
942.7
## 87    362.6             189.0     0.0 164.9             11.6
944.7
## 88    286.3             200.9     0.0 144.7             11.2
1004.6
## 89    362.6             189.0     0.0 164.9             11.6
944.7
## 90    439.0             177.0     0.0 186.0             11.1
884.9
## 91    389.9             189.0     0.0 145.9             22.0
944.7
## 92    362.6             189.0     0.0 164.9             11.6
944.7
## 93    337.9             189.0     0.0 174.9              9.5
944.7
## 94    374.0             189.2     0.0 170.1             10.1
926.1
## 96    425.0             106.3     0.0 153.5             16.5
852.1
## 97    425.0             106.3     0.0 151.4             18.6
936.0
## 99    475.0             118.8     0.0 181.1              8.9
852.1
## 101   425.0             106.3     0.0 153.5             16.5
852.1
## 102   388.6              97.1     0.0 157.9             12.1
852.1
## 104   425.0             106.3     0.0 153.5             16.5
852.1
## 105   318.8             212.5     0.0 155.7             14.3
```

```
852.1
## 106   401.8              94.7     0.0 147.4            11.4
946.8
## 107   362.6             189.0     0.0 164.9            11.6
944.7
## 108   323.7             282.8     0.0 183.8            10.3
942.7
## 110   362.6             189.0     0.0 164.9            11.6
944.7
## 111   286.3             200.9     0.0 144.7            11.2
1004.6
## 112   362.6             189.0     0.0 164.9            11.6
944.7
## 113   439.0             177.0     0.0 186.0            11.1
884.9
## 114   389.9             189.0     0.0 145.9            22.0
944.7
## 115   362.6             189.0     0.0 164.9            11.6
944.7
## 116   337.9             189.0     0.0 174.9             9.5
944.7
## 117   374.0             189.2     0.0 170.1            10.1
926.1
## 119   425.0             106.3     0.0 153.5            16.5
852.1
## 120   425.0             106.3     0.0 151.4            18.6
936.0
## 122   475.0             118.8     0.0 181.1             8.9
852.1
## 124   425.0             106.3     0.0 153.5            16.5
852.1
## 125   388.6              97.1     0.0 157.9            12.1
852.1
## 127   425.0             106.3     0.0 153.5            16.5
852.1
## 128   318.8             212.5     0.0 155.7            14.3
852.1
## 129   401.8              94.7     0.0 147.4            11.4
946.8
## 130   362.6             189.0     0.0 164.9            11.6
944.7
## 133   362.6             189.0     0.0 164.9            11.6
944.7
## 134   286.3             200.9     0.0 144.7            11.2
1004.6
## 135   362.6             189.0     0.0 164.9            11.6
944.7
## 136   439.0             177.0     0.0 186.0            11.1
884.9
## 138   362.6             189.0     0.0 164.9            11.6
```

```
944.7
## 139   337.9              189.0     0.0 174.9              9.5
944.7
## 140   374.0              189.2     0.0 170.1             10.1
926.1
## 142   425.0              106.3     0.0 153.5             16.5
852.1
## 143   425.0              106.3     0.0 151.4             18.6
936.0
## 147   425.0              106.3     0.0 153.5             16.5
852.1
## 148   388.6               97.1     0.0 157.9             12.1
852.1
## 150   425.0              106.3     0.0 153.5             16.5
852.1
## 151   318.8              212.5     0.0 155.7             14.3
852.1
## 162   337.9              189.0     0.0 174.9              9.5
944.7
## 185   222.4                0.0    96.7 189.3              4.5
967.1
## 186   222.4                0.0    96.7 189.3              4.5
967.1
## 187   222.4                0.0    96.7 189.3              4.5
967.1
## 188   222.4                0.0    96.7 189.3              4.5
967.1
## 190   233.8                0.0    94.6 197.9              4.6
947.0
## 191   233.8                0.0    94.6 197.9              4.6
947.0
## 192   233.8                0.0    94.6 197.9              4.6
947.0
## 193   233.8                0.0    94.6 197.9              4.6
947.0
## 195   194.7                0.0   100.5 165.6              7.5
1006.4
## 196   194.7                0.0   100.5 165.6              7.5
1006.4
## 197   194.7                0.0   100.5 165.6              7.5
1006.4
## 198   194.7                0.0   100.5 165.6              7.5
1006.4
## 200   190.7                0.0   125.4 162.1              7.8
1090.0
## 201   190.7                0.0   125.4 162.1              7.8
1090.0
## 202   190.7                0.0   125.4 162.1              7.8
1090.0
## 203   190.7                0.0   125.4 162.1              7.8
```

```
1090.0
## 205   212.1                0.0   121.6 180.3             5.7
1057.6
## 206   212.1                0.0   121.6 180.3             5.7
1057.6
## 207   212.1                0.0   121.6 180.3             5.7
1057.6
## 208   212.1                0.0   121.6 180.3             5.7
1057.6
## 210   230.0                0.0   118.3 195.5             4.6
1029.4
## 211   230.0                0.0   118.3 195.5             4.6
1029.4
## 212   230.0                0.0   118.3 195.5             4.6
1029.4
## 213   230.0                0.0   118.3 195.5             4.6
1029.4
## 215   190.3                0.0   125.2 161.9             9.9
1088.1
## 216   190.3                0.0   125.2 161.9             9.9
1088.1
## 217   190.3                0.0   125.2 161.9             9.9
1088.1
## 218   190.3                0.0   125.2 161.9             9.9
1088.1
## 220   166.1                0.0   163.3 176.5             4.5
1058.6
## 221   166.1                0.0   163.3 176.5             4.5
1058.6
## 222   166.1                0.0   163.3 176.5             4.5
1058.6
## 223   166.1                0.0   163.3 176.5             4.5
1058.6
## 230   213.7               98.1    24.5 181.7             6.9
1065.8
## 231   213.7               98.1    24.5 181.7             6.9
1065.8
## 232   213.7               98.1    24.5 181.7             6.9
1065.8
## 233   213.7               98.1    24.5 181.7             6.9
1065.8
## 235   213.8               98.1    24.5 181.7             6.7
1066.0
## 236   213.8               98.1    24.5 181.7             6.7
1066.0
## 237   213.8               98.1    24.5 181.7             6.7
1066.0
## 238   213.8               98.1    24.5 181.7             6.7
1066.0
## 240   229.7                0.0   118.2 195.2             6.1
```

```
1028.1
## 241   229.7               0.0   118.2 195.2             6.1
1028.1
## 242   229.7               0.0   118.2 195.2             6.1
1028.1
## 243   229.7               0.0   118.2 195.2             6.1
1028.1
## 245   238.1               0.0    94.1 186.7             7.0
949.9
## 246   238.1               0.0    94.1 186.7             7.0
949.9
## 247   238.1               0.0    94.1 186.7             7.0
949.9
## 248   238.1               0.0    94.1 186.7             7.0
949.9
## 250   250.0               0.0    95.7 187.4             5.5
956.9
## 251   250.0               0.0    95.7 187.4             5.5
956.9
## 252   250.0               0.0    95.7 187.4             5.5
956.9
## 253   250.0               0.0    95.7 187.4             5.5
956.9
## 255   212.5               0.0   100.4 159.3             8.7
1007.8
## 256   212.5               0.0   100.4 159.3             8.7
1007.8
## 257   212.5               0.0   100.4 159.3             8.7
1007.8
## 258   212.5               0.0   100.4 159.3             8.7
1007.8
## 260   212.6               0.0   100.4 159.4            10.4
1003.8
## 261   212.6               0.0   100.4 159.4            10.4
1003.8
## 262   212.6               0.0   100.4 159.4            10.4
1003.8
## 263   212.6               0.0   100.4 159.4            10.4
1003.8
## 265   212.0               0.0   124.8 159.0             7.8
1085.4
## 266   212.0               0.0   124.8 159.0             7.8
1085.4
## 267   212.0               0.0   124.8 159.0             7.8
1085.4
## 268   212.0               0.0   124.8 159.0             7.8
1085.4
## 270   231.8               0.0   121.6 174.0             6.7
1056.4
## 271   231.8               0.0   121.6 174.0             6.7
```

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1056.4
## 272   231.8               0.0   121.6 174.0             6.7
1056.4
## 273   231.8               0.0   121.6 174.0             6.7
1056.4
## 275   251.4               0.0   118.3 188.5             5.8
1028.4
## 276   251.4               0.0   118.3 188.5             5.8
1028.4
## 277   251.4               0.0   118.3 188.5             5.8
1028.4
## 278   251.4               0.0   118.3 188.5             5.8
1028.4
## 280   251.4               0.0   118.3 188.5             6.4
1028.4
## 281   251.4               0.0   118.3 188.5             6.4
1028.4
## 282   251.4               0.0   118.3 188.5             6.4
1028.4
## 283   251.4               0.0   118.3 188.5             6.4
1028.4
## 285   181.4               0.0   167.0 169.6             7.6
1055.6
## 286   181.4               0.0   167.0 169.6             7.6
1055.6
## 287   181.4               0.0   167.0 169.6             7.6
1055.6
## 288   181.4               0.0   167.0 169.6             7.6
1055.6
## 290   182.0              45.2   122.0 170.2             8.2
1059.4
## 291   182.0              45.2   122.0 170.2             8.2
1059.4
## 292   182.0              45.2   122.0 170.2             8.2
1059.4
## 293   182.0              45.2   122.0 170.2             8.2
1059.4
## 295   168.9              42.2   124.3 158.3            10.8
1080.8
## 296   168.9              42.2   124.3 158.3            10.8
1080.8
## 297   168.9              42.2   124.3 158.3            10.8
1080.8
## 298   168.9              42.2   124.3 158.3            10.8
1080.8
## 300   290.4               0.0    96.2 168.1             9.4
961.2
## 301   290.4               0.0    96.2 168.1             9.4
961.2
## 302   290.4               0.0    96.2 168.1             9.4
```

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961.2
## 303   290.4               0.0    96.2 168.1             9.4
961.2
## 305   277.1               0.0    97.4 160.6            11.8
973.9
## 306   277.1               0.0    97.4 160.6            11.8
973.9
## 307   277.1               0.0    97.4 160.6            11.8
973.9
## 308   277.1               0.0    97.4 160.6            11.8
973.9
## 310   295.7               0.0    95.6 171.5             8.9
955.1
## 311   295.7               0.0    95.6 171.5             8.9
955.1
## 312   295.7               0.0    95.6 171.5             8.9
955.1
## 313   295.7               0.0    95.6 171.5             8.9
955.1
## 315   251.8               0.0    99.9 146.1            12.4
1006.0
## 316   251.8               0.0    99.9 146.1            12.4
1006.0
## 317   251.8               0.0    99.9 146.1            12.4
1006.0
## 318   251.8               0.0    99.9 146.1            12.4
1006.0
## 320   249.1               0.0    98.8 158.1            12.8
987.8
## 321   249.1               0.0    98.8 158.1            12.8
987.8
## 322   249.1               0.0    98.8 158.1            12.8
987.8
## 323   249.1               0.0    98.8 158.1            12.8
987.8
## 325   252.3               0.0    98.8 146.3            14.2
987.8
## 326   252.3               0.0    98.8 146.3            14.2
987.8
## 327   252.3               0.0    98.8 146.3            14.2
987.8
## 328   252.3               0.0    98.8 146.3            14.2
987.8
## 330   246.8               0.0   125.1 143.3            12.0
1086.8
## 331   246.8               0.0   125.1 143.3            12.0
1086.8
## 332   246.8               0.0   125.1 143.3            12.0
1086.8
## 333   246.8               0.0   125.1 143.3            12.0
```

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1086.8
## 335   275.1               0.0   121.4 159.5             9.9
1053.6
## 336   275.1               0.0   121.4 159.5             9.9
1053.6
## 337   275.1               0.0   121.4 159.5             9.9
1053.6
## 338   275.1               0.0   121.4 159.5             9.9
1053.6
## 340   297.2               0.0   117.5 174.8             9.5
1022.8
## 341   297.2               0.0   117.5 174.8             9.5
1022.8
## 342   297.2               0.0   117.5 174.8             9.5
1022.8
## 343   297.2               0.0   117.5 174.8             9.5
1022.8
## 345   213.7               0.0   174.7 154.8            10.2
1053.5
## 346   213.7               0.0   174.7 154.8            10.2
1053.5
## 347   213.7               0.0   174.7 154.8            10.2
1053.5
## 348   213.7               0.0   174.7 154.8            10.2
1053.5
## 350   213.5               0.0   174.2 154.6            11.7
1052.3
## 351   213.5               0.0   174.2 154.6            11.7
1052.3
## 352   213.5               0.0   174.2 154.6            11.7
1052.3
## 353   213.5               0.0   174.2 154.6            11.7
1052.3
## 355   277.2              97.8    24.5 160.7            11.2
1061.7
## 356   277.2              97.8    24.5 160.7            11.2
1061.7
## 357   277.2              97.8    24.5 160.7            11.2
1061.7
## 358   277.2              97.8    24.5 160.7            11.2
1061.7
## 360   218.2              54.6   123.8 140.8            11.9
1075.7
## 361   218.2              54.6   123.8 140.8            11.9
1075.7
## 362   218.2              54.6   123.8 140.8            11.9
1075.7
## 363   218.2              54.6   123.8 140.8            11.9
1075.7
## 365   214.9              53.8   121.9 155.6             9.6
```

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1014.3
## 366   214.9               53.8   121.9 155.6              9.6
1014.3
## 367   214.9               53.8   121.9 155.6              9.6
1014.3
## 368   214.9               53.8   121.9 155.6              9.6
1014.3
## 370   218.9                0.0   124.1 158.5             11.3
1078.7
## 371   218.9                0.0   124.1 158.5             11.3
1078.7
## 372   218.9                0.0   124.1 158.5             11.3
1078.7
## 373   218.9                0.0   124.1 158.5             11.3
1078.7
## 375   376.0                0.0     0.0 214.6              0.0
1003.5
## 376   376.0                0.0     0.0 214.6              0.0
1003.5
## 377   376.0                0.0     0.0 214.6              0.0
1003.5
## 378   376.0                0.0     0.0 214.6              0.0
1003.5
## 380   500.0                0.0     0.0 140.0              4.0
966.0
## 381   475.0                0.0    59.0 142.0              1.9
1098.0
## 385   516.0                0.0     0.0 162.0              8.2
801.0
## 386   520.0                0.0     0.0 170.0              5.2
855.0
## 387   528.0                0.0     0.0 185.0              6.9
920.0
## 388   520.0                0.0     0.0 175.0              5.2
870.0
## 389   385.0                0.0   136.0 158.0             20.0
903.0
## 393   333.0               17.5   163.0 167.0             17.9
996.0
## 395   405.0                0.0     0.0 175.0              0.0
1120.0
## 396   200.0              200.0     0.0 190.0              0.0
1145.0
## 397   516.0                0.0     0.0 162.0              8.3
801.0
## 398   145.0              116.0   119.0 184.0              5.7
833.0
## 399   160.0              128.0   122.0 182.0              6.4
824.0
## 400   234.0              156.0     0.0 189.0              5.9
```

```
981.0
## 401   250.0              180.0    95.0 159.0              9.5
860.0
## 402   475.0                0.0     0.0 162.0              9.5
1044.0
## 403   285.0              190.0     0.0 163.0              7.6
1031.0
## 404   356.0              119.0     0.0 160.0              9.0
1061.0
## 406   500.0                0.0     0.0 151.0              9.0
1033.0
## 407   165.0                0.0   143.6 163.8              0.0
1005.6
## 408   165.0              128.5   132.1 175.1              8.1
1005.8
## 409   178.0              129.8   118.6 179.9              3.6
1007.3
## 410   167.4              129.9   128.6 175.5              7.8
1006.3
## 411   172.4               13.6   172.4 156.8              4.1
1006.3
## 412   173.5               50.1   173.5 164.8              6.5
1006.2
## 413   167.0               75.4   167.0 164.0              7.9
1007.3
## 414   173.8               93.4   159.9 172.3              9.7
1007.2
## 415   190.3                0.0   125.2 166.6              9.9
1079.0
## 416   250.0                0.0    95.7 191.8              5.3
948.9
## 417   213.5                0.0   174.2 159.2             11.7
1043.6
## 418   194.7                0.0   100.5 170.2              7.5
998.0
## 419   251.4                0.0   118.3 192.9              5.8
1043.6
## 420   165.0                0.0   143.6 163.8              0.0
1005.6
## 421   165.0              128.5   132.1 175.1              8.1
1005.8
## 422   178.0              129.8   118.6 179.9              3.6
1007.3
## 423   167.4              129.9   128.6 175.5              7.8
1006.3
## 424   172.4               13.6   172.4 156.8              4.1
1006.3
## 425   173.5               50.1   173.5 164.8              6.5
1006.2
## 426   167.0               75.4   167.0 164.0              7.9
```

```
1007.3
## 427   173.8              93.4   159.9 172.3             9.7
1007.2
## 428   190.3               0.0   125.2 166.6             9.9
1079.0
## 429   250.0               0.0    95.7 191.8             5.3
948.9
## 430   213.5               0.0   174.2 159.2            11.7
1043.6
## 431   194.7               0.0   100.5 170.2             7.5
998.0
## 432   251.4               0.0   118.3 192.9             5.8
1043.6
## 433   165.0               0.0   143.6 163.8             0.0
1005.6
## 434   165.0             128.5   132.1 175.1             8.1
1005.8
## 435   178.0             129.8   118.6 179.9             3.6
1007.3
## 436   167.4             129.9   128.6 175.5             7.8
1006.3
## 437   172.4              13.6   172.4 156.8             4.1
1006.3
## 438   173.5              50.1   173.5 164.8             6.5
1006.2
## 439   167.0              75.4   167.0 164.0             7.9
1007.3
## 440   173.8              93.4   159.9 172.3             9.7
1007.2
## 441   190.3               0.0   125.2 166.6             9.9
1079.0
## 442   250.0               0.0    95.7 191.8             5.3
948.9
## 443   213.5               0.0   174.2 159.2            11.7
1043.6
## 444   194.7               0.0   100.5 170.2             7.5
998.0
## 445   251.4               0.0   118.3 192.9             5.8
1043.6
## 446   165.0               0.0   143.6 163.8             0.0
1005.6
## 447   165.0             128.5   132.1 175.1             8.1
1005.8
## 448   178.0             129.8   118.6 179.9             3.6
1007.3
## 449   167.4             129.9   128.6 175.5             7.8
1006.3
## 450   172.4              13.6   172.4 156.8             4.1
1006.3
## 451   173.5              50.1   173.5 164.8             6.5
```

```
1006.2
## 452   167.0              75.4   167.0 164.0             7.9
1007.3
## 453   173.8              93.4   159.9 172.3             9.7
1007.2
## 454   190.3               0.0   125.2 166.6             9.9
1079.0
## 455   250.0               0.0    95.7 191.8             5.3
948.9
## 456   213.5               0.0   174.2 159.2            11.7
1043.6
## 457   194.7               0.0   100.5 170.2             7.5
998.0
## 458   251.4               0.0   118.3 192.9             5.8
1043.6
## 472   446.0              24.0    79.0 162.0            11.6
967.0
## 473   446.0              24.0    79.0 162.0            11.6
967.0
## 474   446.0              24.0    79.0 162.0            11.6
967.0
## 475   446.0              24.0    79.0 162.0            10.3
967.0
## 476   446.0              24.0    79.0 162.0            11.6
967.0
## 477   446.0              24.0    79.0 162.0            11.6
967.0
## 478   446.0              24.0    79.0 162.0            11.6
967.0
## 479   446.0              24.0    79.0 162.0            11.6
967.0
## 480   446.0              24.0    79.0 162.0            11.6
967.0
## 481   446.0              24.0    79.0 162.0            11.6
967.0
## 482   446.0              24.0    79.0 162.0            11.6
967.0
## 483   446.0              24.0    79.0 162.0            11.6
967.0
## 484   446.0              24.0    79.0 162.0            11.6
967.0
## 485   446.0              24.0    79.0 162.0            10.3
967.0
## 486   387.0              20.0    94.0 157.0            14.3
938.0
## 487   387.0              20.0    94.0 157.0            13.9
938.0
## 488   387.0              20.0    94.0 157.0            11.6
938.0
## 489   387.0              20.0    94.0 157.0            14.3
```

```
938.0
## 490   387.0              20.0    94.0 157.0            13.9
938.0
## 491   387.0              20.0    94.0 157.0            11.6
938.0
## 492   387.0              20.0    94.0 157.0            14.3
938.0
## 493   387.0              20.0    94.0 157.0            13.9
938.0
## 494   387.0              20.0    94.0 157.0            11.6
938.0
## 495   387.0              20.0    94.0 157.0            14.3
938.0
## 496   387.0              20.0    94.0 157.0            13.9
938.0
## 497   387.0              20.0    94.0 157.0            11.6
938.0
## 498   355.0              19.0    97.0 145.0            13.1
967.0
## 499   355.0              19.0    97.0 145.0            12.3
967.0
## 500   491.0              26.0   123.0 210.0             3.9
882.0
## 501   491.0              26.0   123.0 201.0             3.9
822.0
## 502   491.0              26.0   123.0 210.0             3.9
882.0
## 503   491.0              26.0   123.0 210.0             3.9
882.0
## 504   491.0              26.0   123.0 210.0             3.9
882.0
## 505   491.0              26.0   123.0 201.0             3.9
822.0
## 506   491.0              26.0   123.0 201.0             3.9
822.0
## 507   491.0              26.0   123.0 201.0             3.9
822.0
## 508   424.0              22.0   132.0 178.0             8.5
822.0
## 509   424.0              22.0   132.0 178.0             8.5
882.0
## 511   424.0              22.0   132.0 178.0             8.5
822.0
## 512   424.0              22.0   132.0 178.0             8.5
822.0
## 513   424.0              22.0   132.0 168.0             8.9
822.0
## 514   424.0              22.0   132.0 168.0             8.9
822.0
## 516   202.0              11.0   141.0 206.0             1.7
```

```
942.0
## 517   202.0              11.0   141.0 206.0             1.7
942.0
## 518   202.0              11.0   141.0 206.0             1.7
942.0
## 519   202.0              11.0   141.0 206.0             1.7
942.0
## 520   284.0              15.0   141.0 179.0             5.5
842.0
## 521   284.0              15.0   141.0 179.0             5.5
842.0
## 522   284.0              15.0   141.0 179.0             5.5
842.0
## 523   284.0              15.0   141.0 179.0             5.5
842.0
## 524   359.0              19.0   141.0 154.0            10.9
942.0
## 525   359.0              19.0   141.0 154.0            10.9
942.0
## 526   359.0              19.0   141.0 154.0            10.9
942.0
## 527   359.0              19.0   141.0 154.0            10.9
942.0
## 528   359.0              19.0   141.0 154.0            10.9
942.0
## 529   359.0              19.0   141.0 154.0            10.9
942.0
## 530   359.0              19.0   141.0 154.0            10.9
942.0
## 531   359.0              19.0   141.0 154.0            10.9
942.0
## 532   436.0               0.0     0.0 218.0             0.0
838.4
## 534   289.0               0.0     0.0 192.0             0.0
913.2
## 535   393.0               0.0     0.0 192.0             0.0
940.6
## 537   393.0               0.0     0.0 192.0             0.0
940.6
## 538   480.0               0.0     0.0 192.0             0.0
936.2
## 539   480.0               0.0     0.0 192.0             0.0
936.2
## 541   480.0               0.0     0.0 192.0             0.0
936.2
## 542   333.0               0.0     0.0 192.0             0.0
931.2
## 545   289.0               0.0     0.0 192.0             0.0
913.2
## 547   333.0               0.0     0.0 192.0             0.0
```

```
931.2
## 548   333.0               0.0     0.0 192.0             0.0
931.2
## 549   289.0               0.0     0.0 192.0             0.0
913.2
## 551   393.0               0.0     0.0 192.0             0.0
940.6
## 553   158.8             238.2     0.0 185.7             0.0
1040.6
## 555   238.2             158.8     0.0 185.7             0.0
1040.6
## 556   181.9             272.8     0.0 185.7             0.0
1012.4
## 557   193.5             290.2     0.0 185.7             0.0
998.2
## 558   255.5             170.3     0.0 185.7             0.0
1026.6
## 559   272.8             181.9     0.0 185.7             0.0
1012.4
## 561   220.8             147.2     0.0 185.7             0.0
1055.0
## 562   397.0               0.0     0.0 185.7             0.0
1040.6
## 563   382.5               0.0     0.0 185.7             0.0
1047.8
## 564   210.7             316.1     0.0 185.7             0.0
977.0
## 565   158.8             238.2     0.0 185.7             0.0
1040.6
## 566   295.8               0.0     0.0 185.7             0.0
1091.4
## 567   255.5             170.3     0.0 185.7             0.0
1026.6
## 568   203.5             135.7     0.0 185.7             0.0
1076.2
## 569   397.0               0.0     0.0 185.7             0.0
1040.6
## 570   381.4               0.0     0.0 185.7             0.0
1104.6
## 571   295.8               0.0     0.0 185.7             0.0
1091.4
## 572   228.0             342.1     0.0 185.7             0.0
955.8
## 573   220.8             147.2     0.0 185.7             0.0
1055.0
## 574   316.1             210.7     0.0 185.7             0.0
977.0
## 575   135.7             203.5     0.0 185.7             0.0
1076.2
## 576   238.1               0.0     0.0 185.7             0.0
```

```
1118.8
## 577   339.2               0.0     0.0 185.7             0.0
1069.2
## 578   135.7             203.5     0.0 185.7             0.0
1076.2
## 579   193.5             290.2     0.0 185.7             0.0
998.2
## 580   203.5             135.7     0.0 185.7             0.0
1076.2
## 581   290.2             193.5     0.0 185.7             0.0
998.2
## 582   181.9             272.8     0.0 185.7             0.0
1012.4
## 583   170.3             155.5     0.0 185.7             0.0
1026.6
## 584   210.7             316.1     0.0 185.7             0.0
977.0
## 585   228.0             342.1     0.0 185.7             0.0
955.8
## 586   290.2             193.5     0.0 185.7             0.0
998.2
## 587   381.4               0.0     0.0 185.7             0.0
1104.6
## 588   238.2             158.8     0.0 185.7             0.0
1040.6
## 589   186.2             124.1     0.0 185.7             0.0
1083.4
## 590   339.2               0.0     0.0 185.7             0.0
1069.2
## 591   238.1               0.0     0.0 185.7             0.0
1118.8
## 592   252.5               0.0     0.0 185.7             0.0
1111.6
## 593   382.5               0.0     0.0 185.7             0.0
1047.8
## 594   252.5               0.0     0.0 185.7             0.0
1111.6
## 595   316.1             210.7     0.0 185.7             0.0
977.0
## 596   186.2             124.1     0.0 185.7             0.0
1083.4
## 597   170.3             155.5     0.0 185.7             0.0
1026.6
## 598   272.8             181.9     0.0 185.7             0.0
1012.4
## 599   339.0               0.0     0.0 197.0             0.0
968.0
## 600   339.0               0.0     0.0 197.0             0.0
968.0
## 601   339.0               0.0     0.0 197.0             0.0
```

```
968.0
## 602   339.0               0.0     0.0 197.0             0.0
968.0
## 606   236.0               0.0     0.0 194.0             0.0
968.0
## 607   236.0               0.0     0.0 194.0             0.0
968.0
## 608   236.0               0.0     0.0 194.0             0.0
968.0
## 612   277.0               0.0     0.0 191.0             0.0
968.0
## 613   277.0               0.0     0.0 191.0             0.0
968.0
## 614   277.0               0.0     0.0 191.0             0.0
968.0
## 618   254.0               0.0     0.0 198.0             0.0
968.0
## 624   307.0               0.0     0.0 193.0             0.0
968.0
## 625   307.0               0.0     0.0 193.0             0.0
968.0
## 627   236.0               0.0     0.0 193.0             0.0
968.0
## 628   200.0               0.0     0.0 180.0             0.0
1125.0
## 629   200.0               0.0     0.0 180.0             0.0
1125.0
## 630   225.0               0.0     0.0 181.0             0.0
1113.0
## 631   225.0               0.0     0.0 181.0             0.0
1113.0
## 632   325.0               0.0     0.0 184.0             0.0
1063.0
## 633   325.0               0.0     0.0 184.0             0.0
1063.0
## 634   275.0               0.0     0.0 183.0             0.0
1088.0
## 635   275.0               0.0     0.0 183.0             0.0
1088.0
## 636   300.0               0.0     0.0 184.0             0.0
1075.0
## 637   300.0               0.0     0.0 184.0             0.0
1075.0
## 638   375.0               0.0     0.0 186.0             0.0
1038.0
## 639   375.0               0.0     0.0 186.0             0.0
1038.0
## 640   400.0               0.0     0.0 187.0             0.0
1025.0
## 641   400.0               0.0     0.0 187.0             0.0
```

```
1025.0
## 642   250.0               0.0     0.0 182.0             0.0
1100.0
## 643   250.0               0.0     0.0 182.0             0.0
1100.0
## 644   350.0               0.0     0.0 186.0             0.0
1050.0
## 645   350.0               0.0     0.0 186.0             0.0
1050.0
## 649   141.3             212.0     0.0 203.5             0.0
971.8
## 650   166.8             250.2     0.0 203.5             0.0
975.6
## 652   183.9             122.6     0.0 203.5             0.0
959.2
## 655   122.6             183.9     0.0 203.5             0.0
958.2
## 656   166.8             250.2     0.0 203.5             0.0
975.6
## 657   200.0             133.0     0.0 192.0             0.0
965.4
## 658   108.3             162.4     0.0 203.5             0.0
938.2
## 662   141.3             212.0     0.0 203.5             0.0
971.8
## 663   157.0             236.0     0.0 192.0             0.0
935.4
## 664   133.0             200.0     0.0 192.0             0.0
927.4
## 665   250.2             166.8     0.0 203.5             0.0
977.6
## 666   173.0             116.0     0.0 192.0             0.0
946.8
## 667   192.0             288.0     0.0 192.0             0.0
929.8
## 668   192.0             288.0     0.0 192.0             0.0
929.8
## 670   288.0             192.0     0.0 192.0             0.0
932.0
## 672   236.0             157.0     0.0 192.0             0.0
972.6
## 673   173.0             116.0     0.0 192.0             0.0
946.8
## 674   212.0             141.3     0.0 203.5             0.0
973.4
## 675   236.0             157.0     0.0 192.0             0.0
972.6
## 677   166.8             250.2     0.0 203.5             0.0
975.6
## 679   288.0             192.0     0.0 192.0             0.0
```

```
932.0
## 680   212.0             141.3     0.0 203.5             0.0
973.4
## 682   173.0             116.0     0.0 192.0             0.0
946.8
## 683   183.9             122.6     0.0 203.5             0.0
959.2
## 686   133.0             200.0     0.0 192.0             0.0
927.4
## 689   108.3             162.4     0.0 203.5             0.0
938.2
## 690   157.0             236.0     0.0 192.0             0.0
935.4
## 691   288.0             192.0     0.0 192.0             0.0
932.0
## 692   212.0             141.3     0.0 203.5             0.0
973.4
## 695   236.0             157.0     0.0 192.0             0.0
972.6
## 696   116.0             173.0     0.0 192.0             0.0
909.8
## 697   183.9             122.6     0.0 203.5             0.0
959.2
## 698   108.3             162.4     0.0 203.5             0.0
938.2
## 701   133.0             200.0     0.0 192.0             0.0
927.4
## 703   200.0             133.0     0.0 192.0             0.0
965.4
## 704   200.0             133.0     0.0 192.0             0.0
965.4
## 705   250.2             166.8     0.0 203.5             0.0
977.6
## 706   122.6             183.9     0.0 203.5             0.0
958.2
## 709   116.0             173.0     0.0 192.0             0.0
909.8
## 711   250.2             166.8     0.0 203.5             0.0
977.6
## 713   192.0             288.0     0.0 192.0             0.0
929.8
## 714   157.0             236.0     0.0 192.0             0.0
935.4
## 717   116.0             173.0     0.0 192.0             0.0
909.8
## 718   141.3             212.0     0.0 203.5             0.0
971.8
## 719   122.6             183.9     0.0 203.5             0.0
958.2
## 722   310.0               0.0     0.0 192.0             0.0
```

```
1012.0
## 723   310.0               0.0     0.0 192.0             0.0
1012.0
## 724   310.0               0.0     0.0 192.0             0.0
1012.0
## 727   331.0               0.0     0.0 192.0             0.0
1025.0
## 728   331.0               0.0     0.0 192.0             0.0
1025.0
## 729   331.0               0.0     0.0 192.0             0.0
1025.0
## 732   349.0               0.0     0.0 192.0             0.0
1056.0
## 733   349.0               0.0     0.0 192.0             0.0
1056.0
## 734   349.0               0.0     0.0 192.0             0.0
1056.0
## 737   238.0               0.0     0.0 186.0             0.0
1119.0
## 738   238.0               0.0     0.0 186.0             0.0
1119.0
## 739   296.0               0.0     0.0 186.0             0.0
1090.0
## 740   296.0               0.0     0.0 186.0             0.0
1090.0
## 741   297.0               0.0     0.0 186.0             0.0
1040.0
## 742   480.0               0.0     0.0 192.0             0.0
936.0
## 744   397.0               0.0     0.0 186.0             0.0
1040.0
## 745   281.0               0.0     0.0 186.0             0.0
1104.0
## 746   281.0               0.0     0.0 185.0             0.0
1104.0
## 758   350.0               0.0     0.0 203.0             0.0
974.0
## 759   350.0               0.0     0.0 203.0             0.0
974.0
## 760   350.0               0.0     0.0 203.0             0.0
974.0
## 761   350.0               0.0     0.0 203.0             0.0
974.0
## 764   385.0               0.0     0.0 186.0             0.0
966.0
## 765   385.0               0.0     0.0 186.0             0.0
966.0
## 766   385.0               0.0     0.0 186.0             0.0
966.0
## 767   385.0               0.0     0.0 186.0             0.0
```

```
966.0
## 768   385.0               0.0     0.0 186.0             0.0
966.0
## 771   349.0               0.0     0.0 192.0             0.0
1047.0
## 772   331.0               0.0     0.0 192.0             0.0
978.0
## 773   382.0               0.0     0.0 186.0             0.0
1047.0
## 774   382.0               0.0     0.0 186.0             0.0
1047.0
## 775   382.0               0.0     0.0 186.0             0.0
1111.0
## 776   281.0               0.0     0.0 186.0             0.0
1104.0
## 777   339.0               0.0     0.0 185.0             0.0
1069.0
## 778   339.0               0.0     0.0 185.0             0.0
1069.0
## 779   295.0               0.0     0.0 185.0             0.0
1069.0
## 780   295.0               0.0     0.0 185.0             0.0
1069.0
## 781   238.0               0.0     0.0 185.0             0.0
1118.0
## 782   296.0               0.0     0.0 192.0             0.0
1085.0
## 783   296.0               0.0     0.0 192.0             0.0
1085.0
## 785   331.0               0.0     0.0 192.0             0.0
879.0
## 786   331.0               0.0     0.0 192.0             0.0
978.0
## 787   331.0               0.0     0.0 192.0             0.0
978.0
## 789   349.0               0.0     0.0 192.0             0.0
1047.0
## 790   349.0               0.0     0.0 192.0             0.0
1047.0
## 794   302.0               0.0     0.0 203.0             0.0
974.0
## 801   252.0               0.0     0.0 185.0             0.0
1111.0
## 802   252.0               0.0     0.0 185.0             0.0
1111.0
## 803   339.0               0.0     0.0 185.0             0.0
1060.0
## 804   393.0               0.0     0.0 192.0             0.0
940.0
## 805   393.0               0.0     0.0 192.0             0.0
```

```
940.0
## 807   382.0               0.0     0.0 185.0             0.0
1047.0
## 808   382.0               0.0     0.0 185.0             0.0
1047.0
## 809   252.0               0.0     0.0 186.0             0.0
1111.0
## 810   252.0               0.0     0.0 185.0             0.0
1111.0
## 811   310.0               0.0     0.0 192.0             0.0
970.0
## 812   310.0               0.0     0.0 192.0             0.0
970.0
## 822   322.0               0.0     0.0 203.0             0.0
974.0
## 823   322.0               0.0     0.0 203.0             0.0
974.0
## 825   302.0               0.0     0.0 203.0             0.0
974.0
## 826   397.0               0.0     0.0 185.0             0.0
1040.0
## 827   480.0               0.0     0.0 192.0             0.0
936.0
## 828   522.0               0.0     0.0 146.0             0.0
896.0
## 830   273.0             105.0    82.0 210.0             9.0
904.0
## 831   162.0             190.0   148.0 179.0            19.0
838.0
## 832   154.0             144.0   112.0 220.0            10.0
923.0
## 833   147.0             115.0    89.0 202.0             9.0
860.0
## 834   152.0             178.0   139.0 168.0            18.0
944.0
## 835   310.0             143.0   111.0 168.0            22.0
914.0
## 836   144.0               0.0   175.0 158.0            18.0
943.0
## 837   304.0             140.0     0.0 214.0             6.0
895.0
## 838   374.0               0.0     0.0 190.0             7.0
1013.0
## 839   159.0             149.0   116.0 175.0            15.0
953.0
## 840   153.0             239.0     0.0 200.0             6.0
1002.0
## 841   310.0             143.0     0.0 168.0            10.0
914.0
## 842   305.0               0.0   100.0 196.0            10.0
```

```
959.0
## 843   151.0               0.0   184.0 167.0            12.0
991.0
## 844   142.0             167.0   130.0 174.0            11.0
883.0
## 845   298.0             137.0   107.0 201.0             6.0
878.0
## 846   321.0             164.0     0.0 190.0             5.0
870.0
## 847   366.0             187.0     0.0 191.0             7.0
824.0
## 848   280.0             129.0   100.0 172.0             9.0
825.0
## 849   252.0              97.0    76.0 194.0             8.0
835.0
## 850   165.0               0.0   150.0 182.0            12.0
1023.0
## 851   156.0             243.0     0.0 180.0            11.0
1022.0
## 852   160.0             188.0   146.0 203.0            11.0
829.0
## 853   298.0               0.0   107.0 186.0             6.0
879.0
## 854   318.0               0.0   126.0 210.0             6.0
861.0
## 855   287.0             121.0    94.0 188.0             9.0
904.0
## 856   326.0             166.0     0.0 174.0             9.0
882.0
## 857   356.0               0.0   142.0 193.0            11.0
801.0
## 858   132.0             207.0   161.0 179.0             5.0
867.0
## 859   322.0             149.0     0.0 186.0             8.0
951.0
## 860   164.0               0.0   200.0 181.0            13.0
849.0
## 861   314.0               0.0   113.0 170.0            10.0
925.0
## 862   321.0               0.0   128.0 182.0            11.0
870.0
## 864   288.0             121.0     0.0 177.0             7.0
908.0
## 865   298.0               0.0   107.0 210.0            11.0
880.0
## 866   265.0             111.0    86.0 195.0             6.0
833.0
## 867   160.0             250.0     0.0 168.0            12.0
1049.0
## 868   166.0             260.0     0.0 183.0            13.0
```

```
859.0
## 869   276.0             116.0    90.0 180.0             9.0
870.0
## 870   322.0               0.0   116.0 196.0            10.0
818.0
## 871   149.0             139.0   109.0 193.0             6.0
892.0
## 872   159.0             187.0     0.0 176.0            11.0
990.0
## 873   261.0             100.0    78.0 201.0             9.0
864.0
## 875   313.0               0.0   113.0 178.0             8.0
1002.0
## 876   155.0             183.0     0.0 193.0             9.0
1047.0
## 877   146.0             230.0     0.0 202.0             3.0
827.0
## 878   296.0               0.0   107.0 221.0            11.0
819.0
## 879   133.0             210.0     0.0 196.0             3.0
949.0
## 880   313.0             145.0     0.0 178.0             8.0
867.0
## 881   152.0               0.0   112.0 184.0             8.0
992.0
## 882   153.0             145.0   113.0 178.0             8.0
1002.0
## 883   140.0             133.0   103.0 200.0             7.0
916.0
## 884   149.0             236.0     0.0 176.0            13.0
847.0
## 885   300.0               0.0   120.0 212.0            10.0
878.0
## 886   153.0             145.0   113.0 178.0             8.0
867.0
## 887   148.0               0.0   137.0 158.0            16.0
1002.0
## 888   326.0               0.0   138.0 199.0            11.0
801.0
## 889   153.0             145.0     0.0 178.0             8.0
1000.0
## 890   262.0             111.0    86.0 195.0             5.0
895.0
## 891   158.0               0.0   195.0 220.0            11.0
898.0
## 892   151.0               0.0   185.0 167.0            16.0
1074.0
## 893   273.0               0.0    90.0 199.0            11.0
931.0
## 894   149.0             118.0    92.0 183.0             7.0
```

```
953.0
## 895   143.0             169.0   143.0 191.0             8.0
967.0
## 896   260.0             101.0    78.0 171.0            10.0
936.0
## 897   313.0             161.0     0.0 178.0            10.0
917.0
## 898   284.0             120.0     0.0 168.0             7.0
970.0
## 899   336.0               0.0     0.0 182.0             3.0
986.0
## 900   145.0               0.0   134.0 181.0            11.0
979.0
## 901   150.0             237.0     0.0 174.0            12.0
1069.0
## 902   144.0             170.0   133.0 192.0             8.0
814.0
## 903   331.0             170.0     0.0 195.0             8.0
811.0
## 904   155.0               0.0   143.0 193.0             9.0
1047.0
## 905   155.0             183.0     0.0 193.0             9.0
877.0
## 906   135.0               0.0   166.0 180.0            10.0
961.0
## 907   266.0             112.0    87.0 178.0            10.0
910.0
## 908   314.0             145.0   113.0 179.0             8.0
869.0
## 909   313.0             145.0     0.0 127.0             8.0
1000.0
## 910   146.0             173.0     0.0 182.0             3.0
986.0
## 911   144.0             136.0   106.0 178.0             7.0
941.0
## 912   148.0               0.0   182.0 181.0            15.0
839.0
## 913   277.0             117.0    91.0 191.0             7.0
946.0
## 914   298.0               0.0   107.0 164.0            13.0
953.0
## 915   313.0             145.0     0.0 178.0             8.0
1002.0
## 916   155.0             184.0   143.0 194.0             9.0
880.0
## 917   289.0             134.0     0.0 195.0             6.0
924.0
## 918   148.0             175.0     0.0 171.0             2.0
1000.0
## 919   145.0               0.0   179.0 202.0             8.0
```

```
824.0
## 920   313.0               0.0     0.0 178.0             8.0
1000.0
## 921   136.0             162.0   126.0 172.0            10.0
923.0
## 922   155.0               0.0   143.0 193.0             9.0
877.0
## 923   255.0              99.0    77.0 189.0             6.0
919.0
## 924   162.0             207.0   172.0 216.0            10.0
822.0
## 925   136.0             196.0    98.0 199.0             6.0
847.0
## 926   164.0             163.0   128.0 197.0             8.0
961.0
## 927   162.0             214.0   164.0 202.0            10.0
820.0
## 928   157.0             214.0   152.0 200.0             9.0
819.0
## 930   135.0             105.0   193.0 196.0             6.0
965.0
## 931   159.0             209.0   161.0 201.0             7.0
848.0
## 932   144.0              15.0   195.0 176.0             6.0
1021.0
## 934   167.0             187.0   195.0 185.0             7.0
898.0
## 938   313.3               0.0   113.0 178.5             8.0
1001.9
## 939   154.8             183.4     0.0 193.3             9.1
1047.4
## 940   145.9             230.5     0.0 202.5             3.4
827.0
## 941   296.0               0.0   106.7 221.4            10.5
819.2
## 942   133.1             210.2     0.0 195.7             3.1
949.4
## 943   313.3             145.0     0.0 178.5             8.0
867.2
## 944   151.6               0.0   111.9 184.4             7.9
992.0
## 945   153.1             145.0   113.0 178.5             8.0
1001.9
## 946   139.9             132.6   103.3 200.3             7.4
916.0
## 947   149.5             236.0     0.0 175.8            12.6
846.8
## 948   299.8               0.0   119.8 211.5             9.9
878.2
## 949   153.1             145.0   113.0 178.5             8.0
```

```
867.2
## 950   148.1               0.0   136.6 158.1            16.1
1001.8
## 951   326.5               0.0   137.9 199.0            10.8
801.1
## 952   152.7             144.7     0.0 178.1             8.0
999.7
## 953   261.9             110.5    86.1 195.4             5.0
895.2
## 954   158.4               0.0   194.9 219.7            11.0
897.7
## 955   150.7               0.0   185.3 166.7            15.6
1074.5
## 956   272.6               0.0    89.6 198.7            10.6
931.3
## 957   149.0             117.6    91.7 182.9             7.1
953.4
## 958   143.0             169.4   142.7 190.7             8.4
967.4
## 959   259.9             100.6    78.4 170.6            10.4
935.7
## 960   312.9             160.5     0.0 177.6             9.6
916.6
## 961   284.0             119.7     0.0 168.3             7.2
970.4
## 962   336.5               0.0     0.0 181.9             3.4
985.8
## 963   144.8               0.0   133.6 180.8            11.1
979.5
## 964   150.0             236.8     0.0 173.8            11.9
1069.3
## 965   143.7             170.2   132.6 191.6             8.5
814.1
## 966   330.5             169.6     0.0 194.9             8.1
811.0
## 967   154.8               0.0   142.8 193.3             9.1
1047.4
## 968   154.8             183.4     0.0 193.3             9.1
877.2
## 969   134.7               0.0   165.7 180.2            10.0
961.0
## 970   266.2             112.3    87.5 177.9            10.4
909.7
## 971   314.0             145.3   113.2 178.9             8.0
869.1
## 972   312.7             144.7     0.0 127.3             8.0
999.7
## 973   145.7             172.6     0.0 181.9             3.4
985.8
## 974   143.8             136.3   106.2 178.1             7.5
```

```
941.5
## 975   148.1               0.0   182.1 181.4            15.0
838.9
## 976   277.0             116.8    91.0 190.6             7.0
946.5
## 977   298.1               0.0   107.5 163.6            12.8
953.2
## 978   313.3             145.0     0.0 178.5             8.0
1001.9
## 979   155.2             183.9   143.2 193.8             9.2
879.6
## 980   289.0             133.7     0.0 194.9             5.5
924.1
## 981   147.8             175.1     0.0 171.2             2.2
1000.0
## 982   145.4               0.0   178.9 201.7             7.8
824.0
## 983   312.7               0.0     0.0 178.1             8.0
999.7
## 984   136.4             161.6   125.8 171.6            10.4
922.6
## 985   154.8               0.0   142.8 193.3             9.1
877.2
## 986   255.3              98.8    77.0 188.6             6.5
919.0
## 987   272.8             105.1    81.8 209.7             9.0
904.0
## 988   162.0             190.1   148.1 178.8            18.8
838.1
## 989   153.6             144.2   112.3 220.1            10.1
923.2
## 990   146.5             114.6    89.3 201.9             8.8
860.0
## 991   151.8             178.1   138.7 167.5            18.3
944.0
## 992   309.9             142.8   111.2 167.8            22.1
913.9
## 993   143.6               0.0   174.9 158.4            17.9
942.7
## 994   303.6             139.9     0.0 213.5             6.2
895.5
## 995   374.3               0.0     0.0 190.2             6.7
1013.2
## 996   158.6             148.9   116.0 175.1            15.0
953.3
## 997   152.6             238.7     0.0 200.0             6.3
1001.8
## 998   310.0             142.8     0.0 167.9            10.0
914.3
## 999   304.8               0.0    99.6 196.0             9.8
```

```
959.4
## 1000  150.9               0.0   183.9 166.6            11.6
991.2
## 1001  141.9             166.6   129.7 173.5            10.9
882.6
## 1002  297.8             137.2   106.9 201.3             6.0
878.4
## 1003  321.3             164.2     0.0 190.5             4.6
870.0
## 1004  366.0             187.0     0.0 191.3             6.6
824.3
## 1005  279.8             128.9   100.4 172.4             9.5
825.1
## 1006  252.1              97.1    75.6 193.8             8.3
835.5
## 1007  164.6               0.0   150.4 181.6            11.7
1023.3
## 1008  155.6             243.5     0.0 180.3            10.7
1022.0
## 1009  160.2             188.0   146.4 203.2            11.3
828.7
## 1010  298.1               0.0   107.0 186.4             6.1
879.0
## 1011  317.9               0.0   126.5 209.7             5.7
860.5
## 1012  287.3             120.5    93.9 187.6             9.2
904.4
## 1013  325.6             166.4     0.0 174.0             8.9
881.6
## 1014  355.9               0.0   141.6 193.3            11.0
801.4
## 1015  132.0             206.5   160.9 178.9             5.5
866.9
## 1016  322.5             148.6     0.0 185.8             8.5
951.0
## 1017  164.2               0.0   200.1 181.2            12.6
849.3
## 1018  313.8               0.0   112.6 169.9            10.1
925.3
## 1019  321.4               0.0   127.9 182.5            11.5
870.1
## 1021  288.4             121.0     0.0 177.4             7.0
907.9
## 1022  298.2               0.0   107.0 209.7            11.1
879.6
## 1023  264.5             111.0    86.5 195.5             5.9
832.6
## 1024  159.8             250.0     0.0 168.4            12.2
1049.3
## 1025  166.0             259.7     0.0 183.2            12.7
```

```
858.8
## 1026  276.4              116.0    90.3 179.6              8.9
870.1
## 1027  322.2                0.0   115.6 196.0             10.4
817.9
## 1028  148.5              139.4   108.6 192.7              6.1
892.4
## 1029  159.1              186.7     0.0 175.6             11.3
989.6
## 1030  260.9              100.5    78.3 200.6              8.6
864.5
##      Fine_Aggregate Age_day Concrete_compressive_strength
## 2             676.0      28                         61.89
## 9             670.0      28                         45.85
## 12            825.5      28                         28.02
## 15            670.0      28                         47.81
## 22            806.9      28                         28.24
## 23            806.9       3                          8.06
## 47            806.9       3                         15.05
## 55            806.9       7                         14.59
## 56            825.5       7                         14.64
## 58            825.5       3                          9.13
## 63            850.6       3                          9.87
## 69            670.0      28                         40.86
## 71            756.7       3                         34.40
## 73            887.1       3                         33.40
## 74            803.7       3                         36.30
## 76            781.5       3                         37.80
## 78            887.1       3                         33.40
## 79            925.7       3                         28.10
## 81            887.1       3                         33.40
## 82            880.4       3                         25.20
## 83            852.1       3                         41.10
## 84            755.8       3                         35.30
## 85            659.9       3                         28.30
## 87            755.8       3                         35.30
## 88            803.7       3                         24.40
## 89            755.8       3                         35.30
## 90            707.9       3                         39.30
## 91            755.8       3                         40.60
## 92            755.8       3                         35.30
## 93            755.8       3                         24.10
## 94            756.7       7                         46.20
## 96            887.1       7                         49.20
## 97            803.7       7                         46.80
## 99            781.5       7                         55.60
## 101           887.1       7                         49.20
## 102           925.7       7                         34.90
## 104           887.1       7                         49.20
## 105           880.4       7                         33.40
```

```
## 106          852.1       7                    54.10
## 107          755.8       7                    55.90
## 108          659.9       7                    49.80
## 110          755.8       7                    55.90
## 111          803.7       7                    38.00
## 112          755.8       7                    55.90
## 113          707.9       7                    56.10
## 114          755.8       7                    59.09
## 115          755.8       7                    22.90
## 116          755.8       7                    35.10
## 117          756.7      28                    61.09
## 119          887.1      28                    60.29
## 120          803.7      28                    61.80
## 122          781.5      28                    68.30
## 124          887.1      28                    60.29
## 125          925.7      28                    50.70
## 127          887.1      28                    60.29
## 128          880.4      28                    55.50
## 129          852.1      28                    68.50
## 130          755.8      28                    71.30
## 133          755.8      28                    71.30
## 134          803.7      28                    67.70
## 135          755.8      28                    71.30
## 136          707.9      28                    66.00
## 138          755.8      28                    71.30
## 139          755.8      28                    49.90
## 140          756.7      56                    63.40
## 142          887.1      56                    64.30
## 143          803.7      56                    64.90
## 147          887.1      56                    64.30
## 148          925.7      56                    55.20
## 150          887.1      56                    64.30
## 151          880.4      56                    66.10
## 162          755.8      56                    59.89
## 185          870.3       3                    11.58
## 186          870.3      14                    24.45
## 187          870.3      28                    24.89
## 188          870.3      56                    29.45
## 190          852.2       3                    10.38
## 191          852.2      14                    22.14
## 192          852.2      28                    22.84
## 193          852.2      56                    27.66
## 195          905.9       3                    12.45
## 196          905.9      14                    24.99
## 197          905.9      28                    25.72
## 198          905.9      56                    33.96
## 200          804.0       3                    15.04
## 201          804.0      14                    21.06
## 202          804.0      28                    26.40
## 203          804.0      56                    35.34
```

```
## 205          779.3       3                    12.47
## 206          779.3      14                    20.92
## 207          779.3      28                    24.90
## 208          779.3      56                    34.20
## 210          758.6       3                    10.03
## 211          758.6      14                    20.08
## 212          758.6      28                    24.48
## 213          758.6      56                    31.54
## 215          802.6       3                     9.45
## 216          802.6      14                    22.72
## 217          802.6      28                    28.47
## 218          802.6      56                    38.56
## 220          780.1       3                    10.76
## 221          780.1      14                    25.48
## 222          780.1      28                    21.54
## 223          780.1      56                    28.63
## 230          785.4       3                    18.00
## 231          785.4      14                    30.39
## 232          785.4      28                    45.71
## 233          785.4      56                    50.77
## 235          785.5       3                    13.18
## 236          785.5      14                    17.84
## 237          785.5      28                    40.23
## 238          785.5      56                    47.13
## 240          757.6       3                    13.36
## 241          757.6      14                    22.32
## 242          757.6      28                    24.54
## 243          757.6      56                    31.35
## 245          847.0       3                    19.93
## 246          847.0      14                    25.69
## 247          847.0      28                    30.23
## 248          847.0      56                    39.59
## 250          861.2       3                    13.82
## 251          861.2      14                    24.92
## 252          861.2      28                    29.22
## 253          861.2      56                    38.33
## 255          903.6       3                    13.54
## 256          903.6      14                    26.31
## 257          903.6      28                    31.64
## 258          903.6      56                    42.55
## 260          903.8       3                    13.33
## 261          903.8      14                    25.37
## 262          903.8      28                    37.40
## 263          903.8      56                    44.40
## 265          799.5       3                    19.52
## 266          799.5      14                    31.35
## 267          799.5      28                    38.50
## 268          799.5      56                    45.08
## 270          778.5       3                    15.44
## 271          778.5      14                    26.77
```

```
## 272          778.5      28                    33.73
## 273          778.5      56                    42.70
## 275          757.7       3                    17.22
## 276          757.7      14                    29.93
## 277          757.7      28                    29.65
## 278          757.7      56                    36.97
## 280          757.7       3                    13.12
## 281          757.7      14                    24.43
## 282          757.7      28                    32.66
## 283          757.7      56                    36.64
## 285          777.8       3                    13.62
## 286          777.8      14                    21.60
## 287          777.8      28                    27.77
## 288          777.8      56                    35.57
## 290          780.7       3                     7.32
## 291          780.7      14                    21.50
## 292          780.7      28                    31.27
## 293          780.7      56                    43.50
## 295          796.2       3                     7.40
## 296          796.2      14                    23.51
## 297          796.2      28                    31.12
## 298          796.2      56                    39.15
## 300          865.0       3                    22.50
## 301          865.0      14                    34.67
## 302          865.0      28                    34.74
## 303          865.0      56                    45.08
## 305          875.6       3                    23.14
## 306          875.6      14                    41.89
## 307          875.6      28                    48.28
## 308          875.6      56                    51.04
## 310          859.2       3                    22.95
## 311          859.2      14                    35.23
## 312          859.2      28                    39.94
## 313          859.2      56                    48.72
## 315          899.8       3                    21.02
## 316          899.8      14                    33.36
## 317          899.8      28                    33.94
## 318          899.8      56                    44.14
## 320          889.0       3                    15.36
## 321          889.0      14                    28.68
## 322          889.0      28                    30.85
## 323          889.0      56                    42.03
## 325          889.0       3                    21.78
## 326          889.0      14                    42.29
## 327          889.0      28                    50.60
## 328          889.0      56                    55.83
## 330          800.9       3                    23.52
## 331          800.9      14                    42.22
## 332          800.9      28                    52.50
## 333          800.9      56                    60.32
```

```
## 335          777.5       3                    23.80
## 336          777.5      14                    38.77
## 337          777.5      28                    51.33
## 338          777.5      56                    56.85
## 340          753.5       3                    21.91
## 341          753.5      14                    36.99
## 342          753.5      28                    47.40
## 343          753.5      56                    51.96
## 345          776.4       3                    17.57
## 346          776.4      14                    33.73
## 347          776.4      28                    40.15
## 348          776.4      56                    46.64
## 350          775.5       3                    17.37
## 351          775.5      14                    33.70
## 352          775.5      28                    45.94
## 353          775.5      56                    51.43
## 355          782.5       3                    30.45
## 356          782.5      14                    47.71
## 357          782.5      28                    63.14
## 358          782.5      56                    66.82
## 360          792.7       3                    27.42
## 361          792.7      14                    35.96
## 362          792.7      28                    55.51
## 363          792.7      56                    61.99
## 365          780.6       3                    18.02
## 366          780.6      14                    38.60
## 367          780.6      28                    52.20
## 368          780.6      56                    53.96
## 370          794.9       3                    15.34
## 371          794.9      14                    26.05
## 372          794.9      28                    30.22
## 373          794.9      56                    37.27
## 375          762.4       3                    16.28
## 376          762.4      14                    25.62
## 377          762.4      28                    31.97
## 378          762.4      56                    36.30
## 380          853.0      28                    67.57
## 381          641.0      28                    57.23
## 385          802.0      28                    41.37
## 386          855.0      28                    60.28
## 387          720.0      28                    56.83
## 388          805.0      28                    51.02
## 389          768.0      28                    55.55
## 393          652.0      28                    47.28
## 395          695.0      28                    52.30
## 396          660.0      28                    49.25
## 397          802.0      28                    41.37
## 398          880.0      28                    29.16
## 399          879.0      28                    39.40
## 400          760.0      28                    39.30
```

```
## 401          800.0     28                    67.87
## 402          662.0     28                    58.52
## 403          685.0     28                    53.58
## 404          657.0     28                    59.00
## 406          655.0     28                    69.84
## 407          900.9      3                    14.40
## 408          746.6      3                    19.42
## 409          746.8      3                    20.73
## 410          746.6      3                    14.94
## 411          856.4      3                    21.29
## 412          793.5      3                    23.08
## 413          770.1      3                    15.52
## 414          746.6      3                    15.82
## 415          798.9      3                    12.55
## 416          857.2      3                     8.49
## 417          771.9      3                    15.61
## 418          901.8      3                    12.18
## 419          754.3      3                    11.98
## 420          900.9     14                    16.88
## 421          746.6     14                    33.09
## 422          746.8     14                    34.24
## 423          746.6     14                    31.81
## 424          856.4     14                    29.75
## 425          793.5     14                    33.01
## 426          770.1     14                    32.90
## 427          746.6     14                    29.55
## 428          798.9     14                    19.42
## 429          857.2     14                    24.66
## 430          771.9     14                    29.59
## 431          901.8     14                    24.28
## 432          754.3     14                    20.73
## 433          900.9     28                    26.20
## 434          746.6     28                    46.39
## 435          746.8     28                    39.16
## 436          746.6     28                    41.20
## 437          856.4     28                    33.69
## 438          793.5     28                    38.20
## 439          770.1     28                    41.41
## 440          746.6     28                    37.81
## 441          798.9     28                    24.85
## 442          857.2     28                    27.22
## 443          771.9     28                    44.64
## 444          901.8     28                    37.27
## 445          754.3     28                    33.27
## 446          900.9     56                    36.56
## 447          746.6     56                    53.72
## 448          746.8     56                    48.59
## 449          746.6     56                    51.72
## 450          856.4     56                    35.85
## 451          793.5     56                    53.77
```

```
## 452          770.1     56                    53.46
## 453          746.6     56                    48.99
## 454          798.9     56                    31.72
## 455          857.2     56                    39.64
## 456          771.9     56                    51.26
## 457          901.8     56                    43.39
## 458          754.3     56                    39.27
## 472          712.0     28                    57.03
## 473          712.0     28                    44.42
## 474          712.0     28                    51.02
## 475          712.0     28                    53.39
## 476          712.0      3                    35.36
## 477          712.0      3                    25.02
## 478          712.0      3                    23.35
## 479          712.0      7                    52.01
## 480          712.0      7                    38.02
## 481          712.0      7                    39.30
## 482          712.0     56                    61.07
## 483          712.0     56                    56.14
## 484          712.0     56                    55.25
## 485          712.0     56                    54.77
## 486          845.0     28                    50.24
## 487          845.0     28                    46.68
## 488          845.0     28                    46.68
## 489          845.0      3                    22.75
## 490          845.0      3                    25.51
## 491          845.0      3                    34.77
## 492          845.0      7                    36.84
## 493          845.0      7                    45.90
## 494          845.0      7                    41.67
## 495          845.0     56                    56.34
## 496          845.0     56                    47.97
## 497          845.0     56                    61.46
## 498          871.0     28                    44.03
## 499          871.0     28                    55.45
## 500          699.0     28                    55.55
## 501          699.0     28                    57.92
## 502          699.0      3                    25.61
## 503          699.0      7                    33.49
## 504          699.0     56                    59.59
## 505          699.0      3                    29.55
## 506          699.0      7                    37.92
## 507          699.0     56                    61.86
## 508          750.0     28                    62.05
## 509          750.0      3                    32.01
## 511          750.0      7                    39.00
## 512          750.0     56                    65.70
## 513          750.0      3                    32.11
## 514          750.0      7                    40.29
## 516          801.0     28                    21.97
```

```
## 517          801.0       3                    9.85
## 518          801.0       7                   15.07
## 519          801.0      56                   23.25
## 520          801.0      28                   43.73
## 521          801.0       3                   13.40
## 522          801.0       7                   24.13
## 523          801.0      56                   44.52
## 524          801.0      28                   62.94
## 525          801.0      28                   59.49
## 526          801.0       3                   25.12
## 527          801.0       3                   23.64
## 528          801.0       7                   35.75
## 529          801.0       7                   38.61
## 530          801.0      56                   68.75
## 531          801.0      56                   66.78
## 532          719.7      28                   23.85
## 534          895.3       3                   11.65
## 535          785.6       3                   19.20
## 537          785.6      28                   39.60
## 538          712.2      28                   43.94
## 539          712.2       7                   34.57
## 541          712.2       3                   24.40
## 542          842.6       3                   15.62
## 545          895.3       7                   14.60
## 547          842.6      28                   31.97
## 548          842.6       7                   23.40
## 549          895.3      28                   25.57
## 551          785.6       7                   27.74
## 553          734.3       7                    9.62
## 555          734.3       7                   15.69
## 556          714.3      28                   27.94
## 557          704.3      28                   32.63
## 558          724.3       7                   17.24
## 559          714.3       7                   19.77
## 561          744.3      28                   25.75
## 562          734.3      28                   33.08
## 563          739.3       7                   24.07
## 564          689.3       7                   21.82
## 565          734.3      28                   21.07
## 566          769.3       7                   14.84
## 567          724.3      28                   32.05
## 568          759.3       7                   11.96
## 569          734.3       7                   25.45
## 570          784.3      28                   22.49
## 571          769.3      28                   25.22
## 572          674.3      28                   39.70
## 573          744.3       7                   13.09
## 574          689.3      28                   38.70
## 575          759.3       7                    7.51
## 576          789.3      28                   17.58
```

```
## 577          754.3       7                    21.18
## 578          759.3      28                    18.20
## 579          704.3       7                    17.20
## 580          759.3      28                    22.63
## 581          704.3       7                    21.86
## 582          714.3       7                    12.37
## 583          724.3      28                    25.73
## 584          689.3      28                    37.81
## 585          674.3       7                    21.92
## 586          704.3      28                    33.04
## 587          784.3       7                    14.54
## 588          734.3      28                    26.91
## 589          764.3       7                     8.00
## 590          754.3      28                    31.90
## 591          789.3       7                    10.34
## 592          784.3      28                    19.77
## 593          739.3      28                    37.44
## 594          784.3       7                    11.48
## 595          689.3       7                    24.44
## 596          764.3      28                    17.60
## 597          724.3       7                    10.73
## 598          714.3      28                    31.38
## 599          781.0       3                    13.22
## 600          781.0       7                    20.97
## 601          781.0      14                    27.04
## 602          781.0      28                    32.04
## 606          885.0       3                     6.47
## 607          885.0      14                    12.84
## 608          885.0      28                    18.42
## 612          856.0      14                    21.26
## 613          856.0      28                    25.97
## 614          856.0       3                    11.36
## 618          863.0       3                     9.31
## 624          812.0       3                    12.54
## 625          812.0      28                    27.53
## 627          885.0       7                     9.99
## 628          845.0       7                     7.84
## 629          845.0      28                    12.25
## 630          833.0       7                    11.17
## 631          833.0      28                    17.34
## 632          783.0       7                    17.54
## 633          783.0      28                    30.57
## 634          808.0       7                    14.20
## 635          808.0      28                    24.50
## 636          795.0       7                    15.58
## 637          795.0      28                    26.85
## 638          758.0       7                    26.06
## 639          758.0      28                    38.21
## 640          745.0      28                    43.70
## 641          745.0       7                    30.14
```

```
## 642          820.0       7                    12.73
## 643          820.0      28                    20.87
## 644          770.0       7                    20.28
## 645          770.0      28                    34.29
## 649          748.5      28                    29.89
## 650          692.6       3                     6.90
## 652          800.0       3                     4.90
## 655          800.1      28                    24.29
## 656          692.6      28                    33.95
## 657          806.2       3                    11.41
## 658          849.0      28                    20.59
## 662          748.5       7                    10.39
## 663          781.2      28                    33.66
## 664          839.2      28                    27.87
## 665          694.1       7                    19.35
## 666          856.8       7                    11.39
## 667          716.1       3                    12.79
## 668          716.1      28                    39.32
## 670          717.8       3                    16.11
## 672          749.1       7                    20.42
## 673          856.8       3                     6.94
## 674          750.0       7                    15.03
## 675          749.1       3                    13.57
## 677          692.6       7                    15.75
## 679          717.8      28                    38.80
## 680          750.0      28                    33.00
## 682          856.8      28                    24.28
## 683          800.0      28                    24.05
## 686          839.2       7                    13.66
## 689          849.0       3                     2.33
## 690          781.2       7                    16.89
## 691          717.8       7                    23.52
## 692          750.0       3                     6.81
## 695          749.1      28                    32.88
## 696          891.9      28                    22.35
## 697          800.0       7                    10.79
## 698          849.0       7                     7.72
## 701          839.2       3                     6.88
## 703          806.2       7                    17.17
## 704          806.2      28                    30.44
## 705          694.1       3                     9.73
## 706          800.1       3                     3.32
## 709          891.9       3                     6.28
## 711          694.1      28                    36.96
## 713          716.1       7                    21.48
## 714          781.2       3                     9.69
## 717          891.9       7                    10.09
## 718          748.5       3                     4.83
## 719          800.1       7                    10.35
## 722          830.0       3                    11.85
```

```
## 723          830.0       7                      17.24
## 724          830.0      28                      27.83
## 727          821.0       3                      14.31
## 728          821.0       7                      17.44
## 729          821.0      28                      31.74
## 732          809.0       3                      15.87
## 733          809.0       7                       9.01
## 734          809.0      28                      33.61
## 737          789.0       7                      12.05
## 738          789.0      28                      17.54
## 739          769.0       7                      18.91
## 740          769.0      28                      25.18
## 741          734.0       7                      30.96
## 742          721.0      28                      43.89
## 744          734.0      28                      36.94
## 745          774.0       7                      14.50
## 746          774.0      28                      22.44
## 758          775.0       7                      18.13
## 759          775.0      14                      22.53
## 760          775.0      28                      27.34
## 761          775.0      56                      29.98
## 764          763.0       1                       6.27
## 765          763.0       3                      14.70
## 766          763.0       7                      23.22
## 767          763.0      14                      27.92
## 768          763.0      28                      31.35
## 771          806.0       3                      14.99
## 772          825.0       3                      13.52
## 773          739.0       7                      24.00
## 774          739.0      28                      37.42
## 775          784.0       7                      11.47
## 776          774.0      28                      22.44
## 777          754.0       7                      21.16
## 778          754.0      28                      31.84
## 779          769.0       7                      14.80
## 780          769.0      28                      25.18
## 781          789.0      28                      17.54
## 782          765.0       7                      14.20
## 783          765.0      28                      21.65
## 785          825.0       3                      13.52
## 786          825.0       7                      16.26
## 787          825.0      28                      31.45
## 789          806.0       7                      18.13
## 790          806.0      28                      32.72
## 794          817.0      14                      18.13
## 801          784.0       7                      13.71
## 802          784.0      28                      19.69
## 803          754.0      28                      31.65
## 804          758.0       3                      19.11
## 805          758.0      28                      39.58
```

```
## 807          739.0       7                    24.00
## 808          739.0      28                    37.42
## 809          784.0       7                    11.47
## 810          784.0      28                    19.69
## 811          850.0       7                    14.99
## 812          850.0      28                    27.92
## 822          800.0      14                    20.77
## 823          800.0      28                    25.18
## 825          817.0      28                    21.75
## 826          734.0      28                    39.09
## 827          721.0       3                    24.39
## 828          896.0       7                    50.51
## 830          680.0      28                    37.17
## 831          741.0      28                    33.76
## 832          658.0      28                    16.50
## 833          829.0      28                    19.99
## 834          695.0      28                    36.35
## 835          651.0      28                    33.69
## 836          844.0      28                    15.42
## 837          722.0      28                    33.42
## 838          730.0      28                    39.05
## 839          720.0      28                    27.68
## 840          684.0      28                    26.86
## 841          804.0      28                    45.30
## 842          705.0      28                    30.12
## 843          772.0      28                    15.57
## 844          785.0      28                    44.61
## 845          655.0      28                    53.52
## 846          774.0      28                    57.21
## 847          757.0      28                    65.91
## 848          805.0      28                    52.82
## 849          821.0      28                    33.40
## 850          729.0      28                    18.03
## 851          698.0      28                    37.36
## 852          710.0      28                    32.84
## 853          815.0      28                    42.64
## 854          737.0      28                    40.06
## 855          696.0      28                    41.94
## 856          790.0      28                    61.23
## 857          778.0      28                    40.87
## 858          736.0      28                    33.30
## 859          709.0      28                    52.42
## 860          846.0      28                    15.09
## 861          783.0      28                    38.46
## 862          780.0      28                    37.26
## 864          829.0      28                    42.13
## 865          744.0      28                    31.87
## 866          790.0      28                    41.54
## 867          688.0      28                    39.45
## 868          827.0      28                    37.91
```

```
## 869          768.0     28                    44.28
## 870          813.0     28                    31.18
## 871          780.0     28                    23.69
## 872          789.0     28                    32.76
## 873          761.0     28                    32.40
## 875          689.0     28                    36.80
## 876          697.0     28                    18.28
## 877          872.0     28                    33.06
## 878          778.0     28                    31.42
## 879          795.0     28                    31.03
## 880          824.0     28                    44.39
## 881          816.0     28                    12.18
## 882          689.0     28                    25.56
## 883          753.0     28                    36.44
## 884          893.0     28                    32.96
## 885          728.0     28                    23.84
## 886          824.0     28                    26.23
## 887          830.0     28                    17.95
## 888          792.0     28                    40.68
## 889          822.0     28                    19.01
## 890          733.0     28                    33.72
## 891          713.0     28                     8.54
## 892          678.0     28                    13.46
## 893          762.0     28                    32.24
## 894          780.0     28                    23.52
## 895          643.0     28                    29.72
## 896          763.0     28                    49.77
## 897          759.0     28                    52.44
## 898          794.0     28                    40.93
## 899          817.0     28                    44.86
## 900          812.0     28                    13.20
## 901          675.0     28                    37.43
## 902          805.0     28                    29.87
## 903          802.0     28                    56.61
## 904          697.0     28                    12.46
## 905          868.0     28                    23.79
## 906          805.0     28                    13.29
## 907          745.0     28                    39.42
## 908          690.0     28                    46.23
## 909          822.0     28                    44.52
## 910          817.0     28                    23.74
## 911          774.0     28                    26.14
## 912          884.0     28                    15.52
## 913          666.0     28                    43.57
## 914          784.0     28                    35.86
## 915          689.0     28                    41.05
## 916          699.0     28                    28.99
## 917          760.0     28                    46.24
## 918          828.0     28                    26.92
## 919          869.0     28                    10.54
```

```
## 920          822.0     28                    25.10
## 921          764.0     28                    29.07
## 922          868.0     28                     9.74
## 923          749.0     28                    33.80
## 924          638.0     28                    39.84
## 925          783.0     28                    26.97
## 926          641.0     28                    27.23
## 927          680.0     28                    30.65
## 928          704.0     28                    33.05
## 930          643.0     28                    21.91
## 931          669.0     28                    30.88
## 932          709.0     28                    15.34
## 934          636.0     28                    23.89
## 938          688.7     28                    36.80
## 939          696.7     28                    18.29
## 940          871.8     28                    32.72
## 941          778.4     28                    31.42
## 942          795.3     28                    28.94
## 943          824.0     28                    40.93
## 944          815.9     28                    12.18
## 945          688.7     28                    25.56
## 946          753.4     28                    36.44
## 947          892.7     28                    32.96
## 948          727.6     28                    23.84
## 949          824.0     28                    26.23
## 950          830.1     28                    17.96
## 951          792.5     28                    38.63
## 952          822.2     28                    19.01
## 953          732.6     28                    33.72
## 954          712.9     28                     8.54
## 955          678.0     28                    13.46
## 956          762.2     28                    32.25
## 957          780.3     28                    23.52
## 958          643.5     28                    29.73
## 959          762.9     28                    49.77
## 960          759.5     28                    52.45
## 961          794.2     28                    40.93
## 962          816.8     28                    44.87
## 963          811.5     28                    13.20
## 964          674.8     28                    37.43
## 965          805.3     28                    29.87
## 966          802.3     28                    56.62
## 967          696.7     28                    12.46
## 968          867.7     28                    23.79
## 969          804.9     28                    13.29
## 970          744.5     28                    39.42
## 971          690.2     28                    46.23
## 972          822.2     28                    44.52
## 973          816.8     28                    23.74
## 974          774.3     28                    26.15
```

```
## 975          884.3     28                    15.53
## 976          665.6     28                    43.58
## 977          784.0     28                    35.87
## 978          688.7     28                    41.05
## 979          698.5     28                    28.99
## 980          760.1     28                    46.25
## 981          828.5     28                    26.92
## 982          868.7     28                    10.54
## 983          822.2     28                    25.10
## 984          764.4     28                    29.07
## 985          867.7     28                     9.74
## 986          749.3     28                    33.80
## 987          679.7     28                    37.17
## 988          741.4     28                    33.76
## 989          657.9     28                    16.50
## 990          829.5     28                    19.99
## 991          694.6     28                    36.35
## 992          651.2     28                    38.22
## 993          844.5     28                    15.42
## 994          722.5     28                    33.42
## 995          730.4     28                    39.06
## 996          719.7     28                    27.68
## 997          683.9     28                    26.86
## 998          804.0     28                    45.30
## 999          705.2     28                    30.12
## 1000         772.2     28                    15.57
## 1001         785.3     28                    44.61
## 1002         655.3     28                    53.52
## 1003         774.0     28                    57.22
## 1004         756.9     28                    65.91
## 1005         804.9     28                    52.83
## 1006         821.4     28                    33.40
## 1007         728.9     28                    18.03
## 1008         697.7     28                    37.36
## 1009         709.7     28                    35.31
## 1010         815.2     28                    42.64
## 1011         736.6     28                    40.06
## 1012         695.9     28                    43.80
## 1013         790.0     28                    61.24
## 1014         778.4     28                    40.87
## 1015         735.6     28                    33.31
## 1016         709.5     28                    52.43
## 1017         846.0     28                    15.09
## 1018         782.9     28                    38.46
## 1019         779.7     28                    37.27
## 1021         829.5     28                    42.14
## 1022         744.2     28                    31.88
## 1023         790.4     28                    41.54
## 1024         688.2     28                    39.46
## 1025         826.8     28                    37.92
```

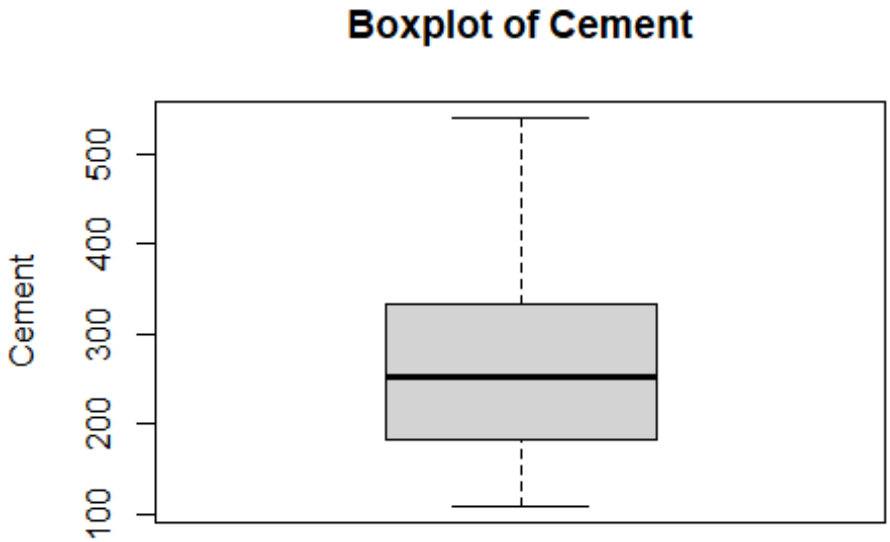
```
## 1026          768.3      28                          44.28
## 1027          813.4      28                          31.18
## 1028          780.0      28                          23.70
## 1029          788.9      28                          32.77
## 1030          761.5      28                          32.40

nrow(cleaned_data)

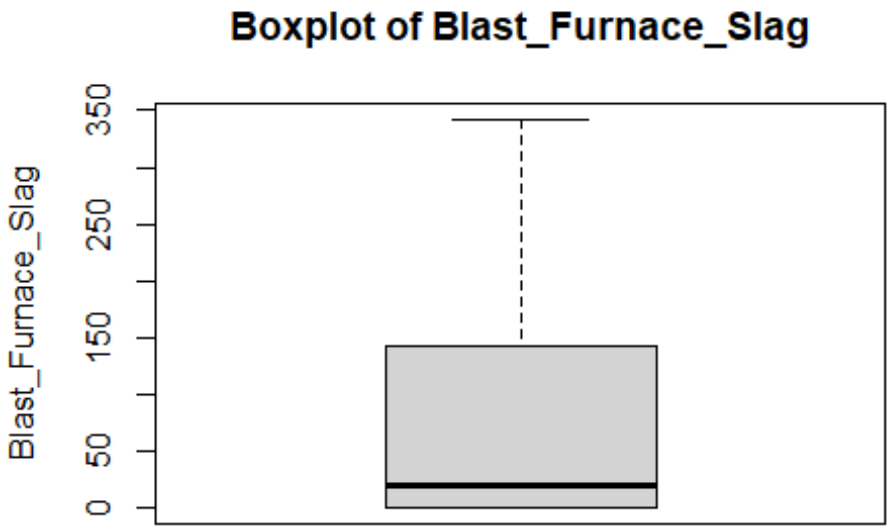
## [1] 743
```

##########Boxplots after removing Outliers

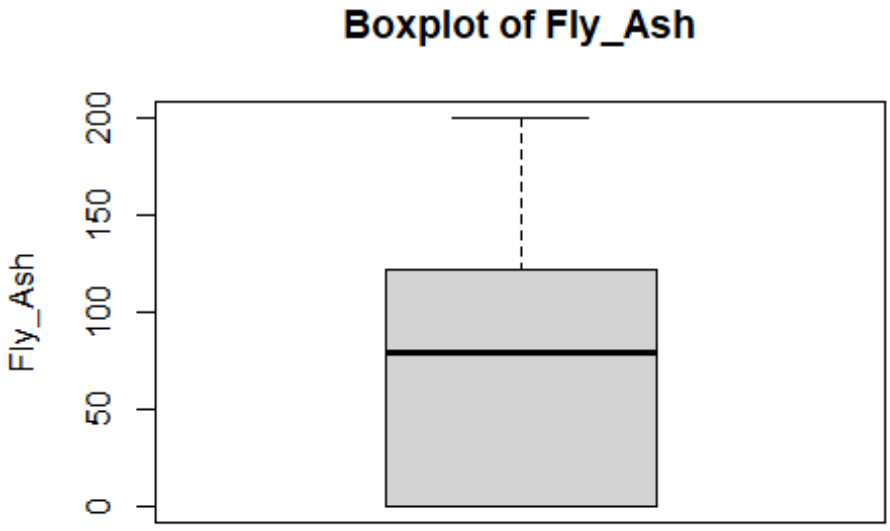
```
#Cement
##Boxplot
boxplot(cleaned_data$Cement,ylab="Cement",main="Boxplot of Cement")
```



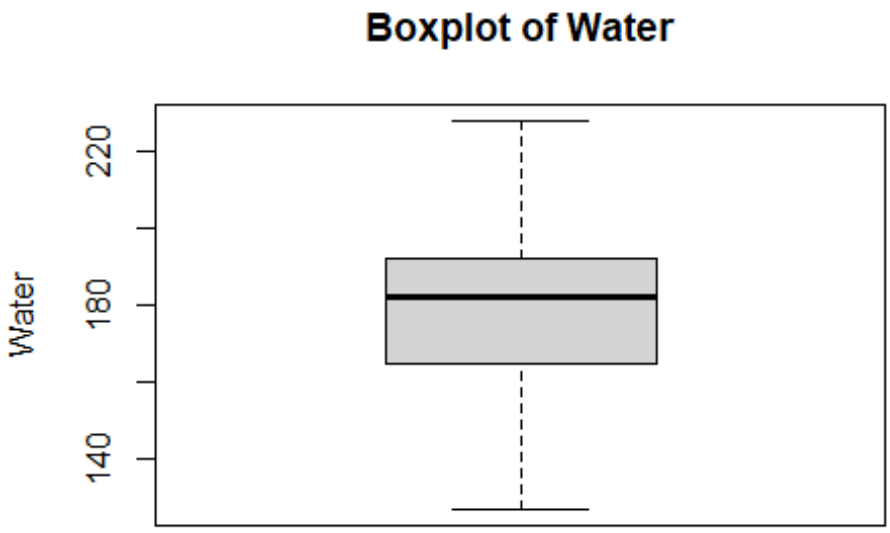

```
#Blast_Furnace_Slag
##Boxplot
boxplot(cleaned_data$Blast_Furnace_Slag,ylab="Blast_Furnace_Slag",main="Boxpl
ot of Blast_Furnace_Slag")
```



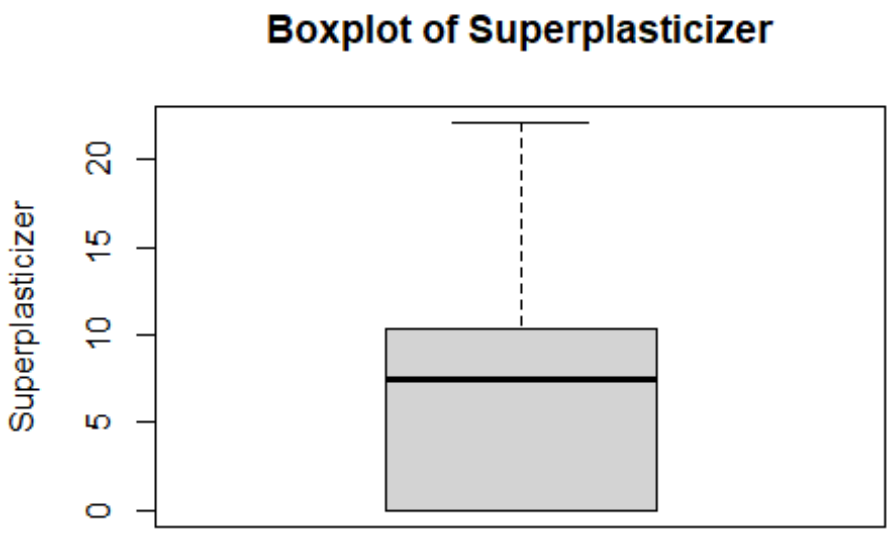

```
##Fly_Ash
##Boxplot
boxplot(cleaned_data$Fly_Ash,ylab="Fly_Ash",main="Boxplot of Fly_Ash")
```



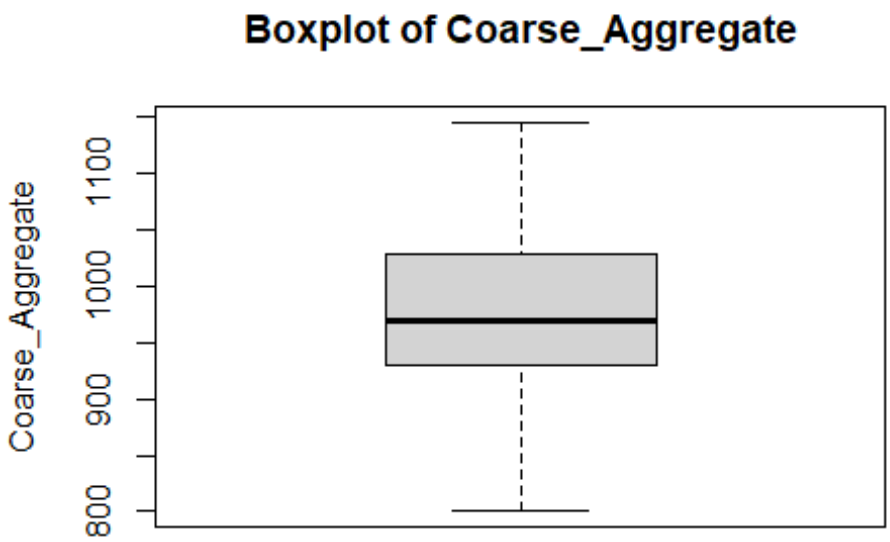
```r
#Water
##Boxplot
boxplot(cleaned_data$Water,ylab="Water",main="Boxplot of Water")
```



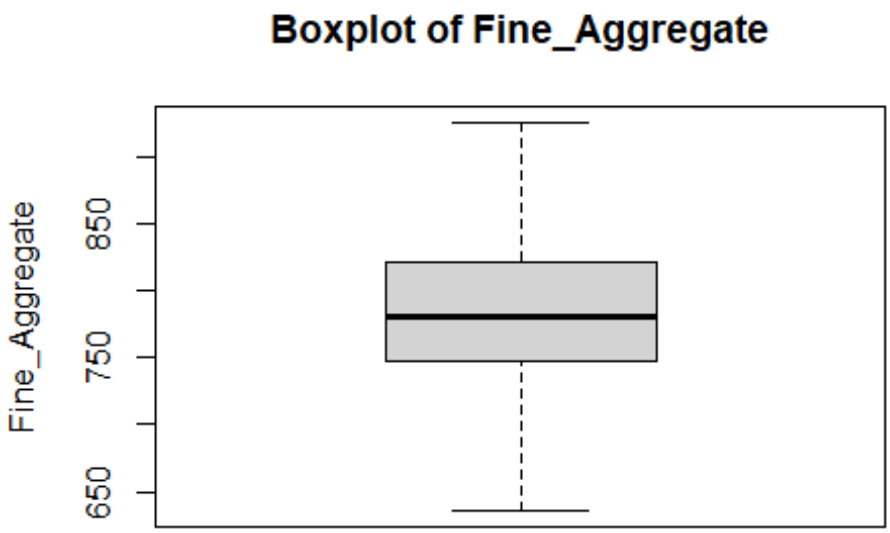

```r
#Superplasticizer
##Boxplot
boxplot(cleaned_data$Superplasticizer,ylab="Superplasticizer",main="Boxplot
of Superplasticizer")
```



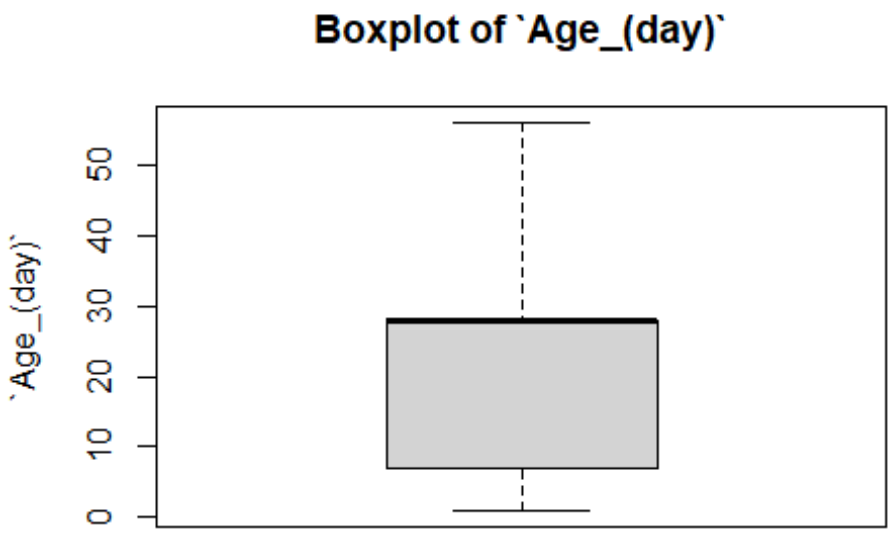

```
##Coarse_Aggregate
##Boxplot
boxplot(cleaned_data$Coarse_Aggregate,ylab="Coarse_Aggregate",main="Boxplot
of Coarse_Aggregate")
```



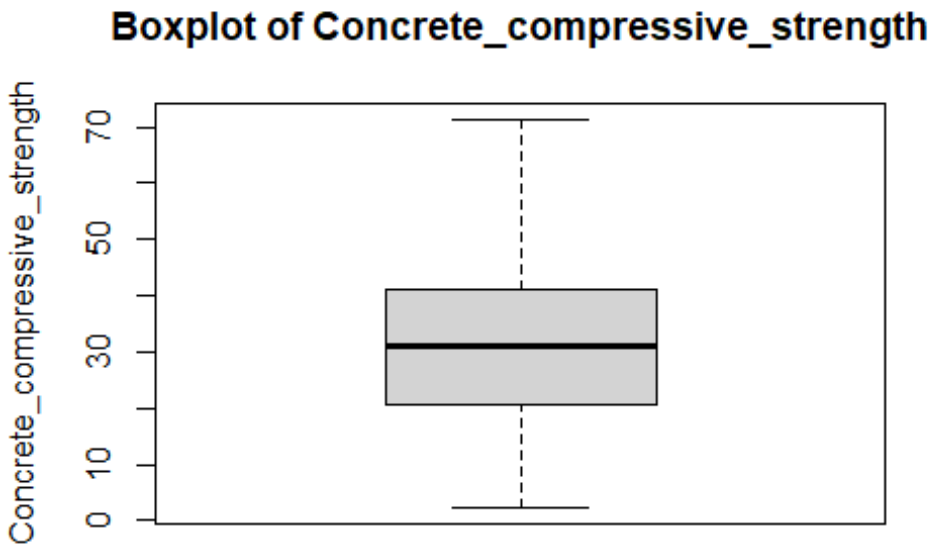

```
##Fine_Aggregate
##Boxplot
boxplot(cleaned_data$Fine_Aggregate,ylab="Fine_Aggregate",main="Boxplot of
Fine_Aggregate")
```




```
#Age_(day)
##Boxplot
boxplot(cleaned_data$Age_day,ylab="`Age_(day)`",main="Boxplot of
`Age_(day)`")
```




```
#Concrete_compressive_strength
##Boxplot
boxplot(cleaned_data$Concrete_compressive_strength,ylab="Concrete_compressive
_strength",main="Boxplot of Concrete_compressive_strength")
```



All the boxplots seems like no including outliers. Now we can consider the cleaned dataset.(After removing outliers)

```
###This is our cleaned dataset


head(cleaned_data)

##    Cement Blast_Furnace_Slag Fly_Ash Water Superplasticizer
Coarse_Aggregate
## 2   540.0                0.0       0   162              2.5
1055.0
## 9   266.0              114.0       0   228              0.0
932.0
## 12  198.6              132.4       0   192              0.0
978.4
## 15  304.0               76.0       0   228              0.0
932.0
## 22  139.6              209.4       0   192              0.0
1047.0
## 23  139.6              209.4       0   192              0.0
1047.0
##    Fine_Aggregate Age_day Concrete_compressive_strength
## 2           676.0      28                         61.89
## 9           670.0      28                         45.85
## 12          825.5      28                         28.02
## 15          670.0      28                         47.81
```

```
## 22          806.9      28                          28.24
## 23          806.9       3                           8.06
```

```
nrow(cleaned_data)
```

```
## [1] 743
```

Now cleaned datset has 743 data.

```
#####Install packages#######
```

```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 4.3.3
```

```
##
## 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
```

```
library(tidyr)
```

```
## Warning: package 'tidyr' was built under R version 4.3.3
```

```
library(MASS)
```

```
##
## Attaching package: 'MASS'
```

```
## The following object is masked from 'package:dplyr':
##
##     select
```

```
library(Metrics)
```

```
## Warning: package 'Metrics' was built under R version 4.3.3
```

```
#install.packages("ISLR")
library(ISLR)
```

```
## Warning: package 'ISLR' was built under R version 4.3.3
```

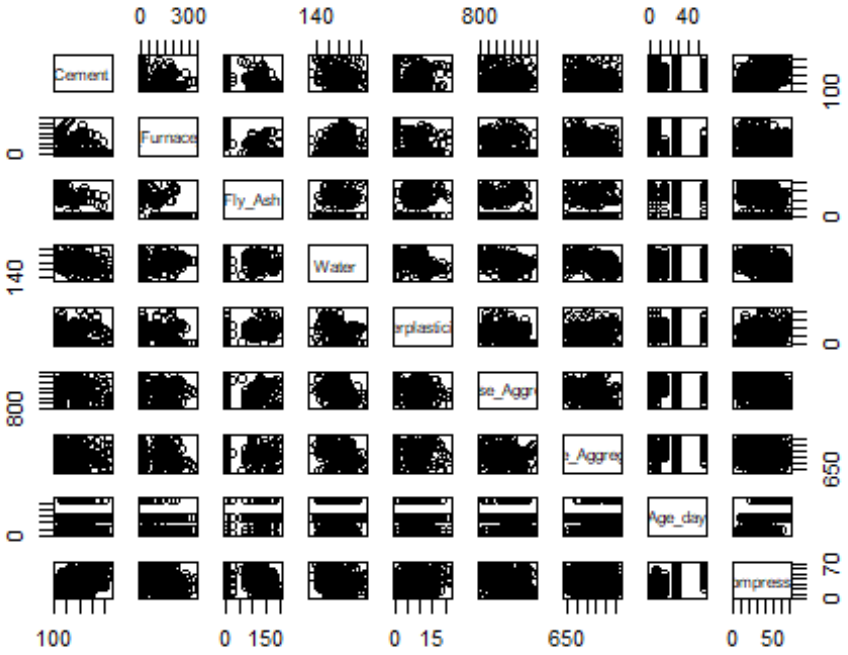
```
library(leaps)
```

```
## Warning: package 'leaps' was built under R version 4.3.3
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.3.3

#install.packages("quantmod")
library(quantmod)

## Warning: package 'quantmod' was built under R version 4.3.3

## Loading required package: xts

## Warning: package 'xts' was built under R version 4.3.3

## Loading required package: zoo

## Warning: package 'zoo' was built under R version 4.3.3

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric

##
## ############################ Warning from 'xts' package
############################
## #
#
## # The dplyr lag() function breaks how base R's lag() function is supposed
to  #
## # work, which breaks lag(my_xts). Calls to lag(my_xts) that you type or
#
## # source() into this session won't work correctly.
#
## #
#
## # Use stats::lag() to make sure you're not using dplyr::lag(), or you can
add #
## # conflictRules('dplyr', exclude = 'lag') to your .Rprofile to stop
#
## # dplyr from breaking base R's lag() function.
#
## #
#
## # Code in packages is not affected. It's protected by R's namespace
mechanism #
## # Set `options(xts.warn_dplyr_breaks_lag = FALSE)` to suppress this
warning.  #
## #
#
##
################################################################################
##
```

```
##
## Attaching package: 'xts'

## The following objects are masked from 'package:dplyr':
##
##     first, last

## Loading required package: TTR

## Warning: package 'TTR' was built under R version 4.3.3

## Registered S3 method overwritten by 'quantmod':
##   method            from
##   as.zoo.data.frame zoo

#install.packages("corrplot")
library(corrplot)

## Warning: package 'corrplot' was built under R version 4.3.3

## corrplot 0.94 loaded

#install.packages("caTools")
library(caTools)

## Warning: package 'caTools' was built under R version 4.3.3

#install.packages("car")
library(car)

## Warning: package 'car' was built under R version 4.3.3

## Loading required package: carData

## Warning: package 'carData' was built under R version 4.3.2

##
## Attaching package: 'car'

## The following object is masked from 'package:dplyr':
##
##     recode

###Scatter plots
pairs(cleaned_data)
```




```
###Correlations
cor(cleaned_data)
```

```
##                                     Cement Blast_Furnace_Slag      Fly_Ash
## Cement                           1.00000000        -0.27971623 -0.341415172
## Blast_Furnace_Slag              -0.27971623         1.00000000 -0.352544258
## Fly_Ash                         -0.34141517        -0.35254426  1.000000000
## Water                           -0.14702287         0.11739039 -0.217805378
## Superplasticizer                 0.06113094         0.02875183  0.463677653
## Coarse_Aggregate                -0.22552072        -0.28929599 -0.060590839
## Fine_Aggregate                  -0.08050495        -0.32084239 -0.010749873
## Age_day                         -0.07425523        -0.04530860  0.220933560
## Concrete_compressive_strength    0.47695750         0.13352622 -0.003269246
##                                      Water Superplasticizer Coarse_Aggregate
## Cement                          -0.1470229       0.06113094      -0.22552072
## Blast_Furnace_Slag               0.1173904       0.02875183      -0.28929599
## Fly_Ash                         -0.2178054       0.46367765      -0.06059084
## Water                            1.0000000      -0.59876227      -0.21052294
## Superplasticizer                -0.5987623       1.00000000      -0.28823582
## Coarse_Aggregate                -0.2105229      -0.28823582       1.00000000
## Fine_Aggregate                  -0.3205256       0.08901256      -0.09515077
## Age_day                         -0.0664858       0.20628051      -0.05946750
## Concrete_compressive_strength   -0.3907891       0.44095203      -0.28596944
##                                 Fine_Aggregate     Age_day
## Cement                          -0.08050495 -0.07425523
## Blast_Furnace_Slag              -0.32084239 -0.04530860
## Fly_Ash                         -0.01074987  0.22093356
```

```
## Water                              -0.32052562 -0.06648580
## Superplasticizer                    0.08901256  0.20628051
## Coarse_Aggregate                   -0.09515077 -0.05946750
## Fine_Aggregate                      1.00000000 -0.02005979
## Age_day                            -0.02005979  1.00000000
## Concrete_compressive_strength      -0.11498959  0.55002463
##                                Concrete_compressive_strength
## Cement                                             0.476957501
## Blast_Furnace_Slag                                 0.133526216
## Fly_Ash                                           -0.003269246
## Water                                             -0.390789073
## Superplasticizer                                   0.440952027
## Coarse_Aggregate                                  -0.285969442
## Fine_Aggregate                                    -0.114989585
## Age_day                                            0.550024634
## Concrete_compressive_strength                      1.000000000
```

```
###All predictors

lm_0<-lm(Concrete_compressive_strength~.,data = cleaned_data)
summary(lm_0)

##
## Call:
## lm(formula = Concrete_compressive_strength ~ ., data = cleaned_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -20.3813  -4.1641  -0.2573   3.5924  22.8379
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)         9.190936  21.489112   0.428    0.669
## Cement              0.106565   0.006802  15.667  < 2e-16 ***
## Blast_Furnace_Slag  0.081090   0.008091  10.022  < 2e-16 ***
## Fly_Ash             0.046481   0.009799   4.743 2.53e-06 ***
## Water              -0.195457   0.033283  -5.873 6.50e-09 ***
## Superplasticizer    0.133636   0.083426   1.602    0.110
## Coarse_Aggregate    0.002577   0.007773   0.332    0.740
## Fine_Aggregate      0.005990   0.008563   0.700    0.484
## Age_day             0.548990   0.017257  31.813  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.877 on 734 degrees of freedom
## Multiple R-squared:  0.7927, Adjusted R-squared:  0.7904
## F-statistic: 350.8 on 8 and 734 DF,  p-value: < 2.2e-16
```

##Interpretation *The model is highly significant with a p-value < 2.2e16, indicating that the predictors jointly have a significant effect on the concrete compressive strength.

The model explains about 79.04% of the variability in concrete compressive strength (Rsquared = 0.7904). The significant predictors include cement, blast furnace slag, fly ash, water and age of the concrete.superplasticizer, Coarse and fine aggregates were not significant predictors in this model. The model's overall F-test indicates it is a good fit for the data.

```
###Anova test

anova(lm_0)
```

```
## Analysis of Variance Table
##
## Response: Concrete_compressive_strength
##                      Df Sum Sq Mean Sq   F value    Pr(>F)
## Cement                1  38081   38081  805.3194 < 2.2e-16 ***
## Blast_Furnace_Slag    1  12941   12941  273.6626 < 2.2e-16 ***
## Fly_Ash               1  21051   21051  445.1727 < 2.2e-16 ***
## Water                 1  11025   11025  233.1594 < 2.2e-16 ***
## Superplasticizer      1   1699    1699   35.9398 3.191e-09 ***
## Coarse_Aggregate      1      2       2    0.0448    0.8324
## Fine_Aggregate        1     31      31    0.6569    0.4179
## Age_day               1  47859   47859 1012.0896 < 2.2e-16 ***
## Residuals           734  34709      47
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

##Interpretation *.Cement, Blast Furnace Slag, Fly Ash, Water, Superplasticizers, and Age are all statistically significant contributors to compressive strength, with Age and Cement having the most substantial effects.

*.Coarse and Fine Aggregates do not have a statistically significant impact on compressive strength, as indicated by their low F values and high p-values.

This ANOVA analysis shows that the mix components related to binders (Cement, Fly Ash, Blast Furnace Slag) and curing time (Age) play key roles in determining compressive strength, while aggregates do not significantly affect the outcome in this dataset.

```
########Model Selection###########

######Forward stepwise Selection#########
fit_frwd<-regsubsets(Concrete_compressive_strength~ .,data =
cleaned_data,nvmax = 8,method = "forward")
frwd_summary<-summary(fit_frwd)
frwd_summary
```

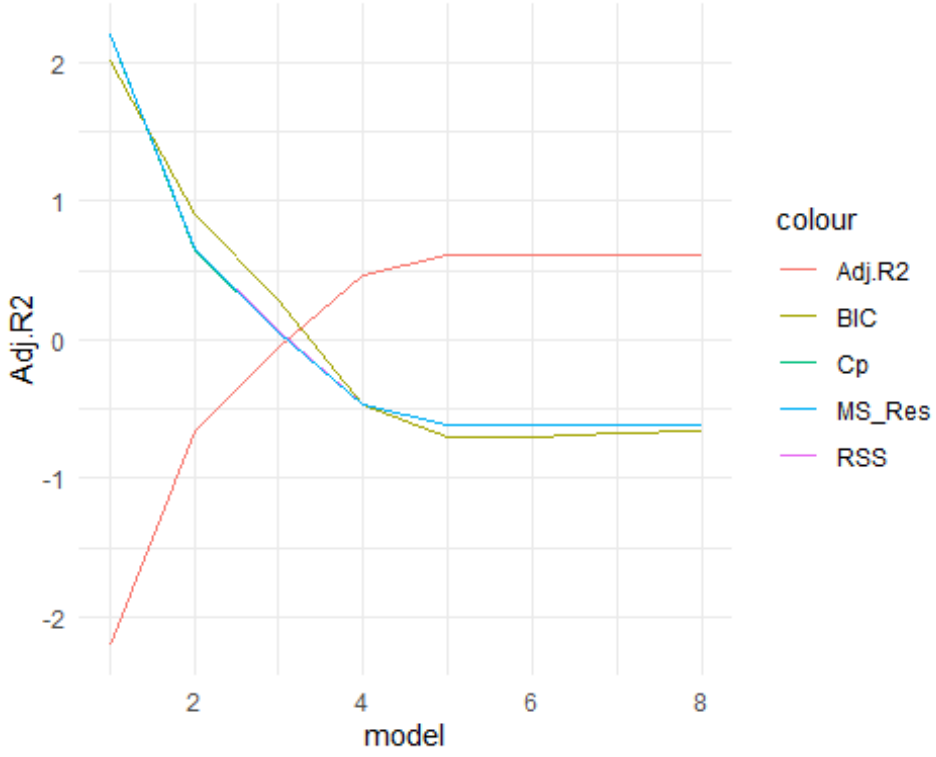
```
## Subset selection object
## Call: regsubsets.formula(Concrete_compressive_strength ~ ., data =
cleaned_data,
##     nvmax = 8, method = "forward")
## 8 Variables  (and intercept)
```

```
##                     Forced in Forced out
## Cement                  FALSE      FALSE
## Blast_Furnace_Slag      FALSE      FALSE
## Fly_Ash                 FALSE      FALSE
## Water                   FALSE      FALSE
## Superplasticizer        FALSE      FALSE
## Coarse_Aggregate        FALSE      FALSE
## Fine_Aggregate          FALSE      FALSE
## Age_day                 FALSE      FALSE
## 1 subsets of each size up to 8
## Selection Algorithm: forward
##          Cement Blast_Furnace_Slag Fly_Ash Water Superplasticizer
## 1  ( 1 ) " "    " "                " "     " "   " "
## 2  ( 1 ) "*"    " "                " "     " "   " "
## 3  ( 1 ) "*"    "*"                " "     " "   " "
## 4  ( 1 ) "*"    "*"                " "     "*"   " "
## 5  ( 1 ) "*"    "*"                "*"     "*"   " "
## 6  ( 1 ) "*"    "*"                "*"     "*"   "*"
## 7  ( 1 ) "*"    "*"                "*"     "*"   "*"
## 8  ( 1 ) "*"    "*"                "*"     "*"   "*"
##          Coarse_Aggregate Fine_Aggregate Age_day
## 1  ( 1 ) " "              " "            "*"
## 2  ( 1 ) " "              " "            "*"
## 3  ( 1 ) " "              " "            "*"
## 4  ( 1 ) " "              " "            "*"
## 5  ( 1 ) " "              " "            "*"
## 6  ( 1 ) " "              " "            "*"
## 7  ( 1 ) " "              "*"            "*"
## 8  ( 1 ) "*"              "*"            "*"
```

```r
###########Find Adj R^2,Cp,BIC,RSS values
criterion<-data.frame(model=1:8,
                      Adj.R2=(frwd_summary$adjr2),
                      Cp=(frwd_summary$cp),
                      BIC=(frwd_summary$bic),
                      RSS=(frwd_summary$rss))
##Add MS_Res
n<-nrow(cleaned_data)

criterion$MS_Res<-criterion$RSS/(n-criterion$model-1)


##Standardize
criterion_std<-cbind(model=criterion$model,scale(criterion[,-1]))
criterion_std<-as.data.frame(criterion_std)

###Values
criterion_std
```

```
##   model      Adj.R2          Cp        BIC         RSS      MS_Res
## 1     1 -2.20245417  2.20479801  2.0077826  2.20174188  2.20245417
## 2     2 -0.65123557  0.64818529  0.8975572  0.65206390  0.65123557
## 3     3 -0.06506217  0.06151346  0.2882098  0.06598221  0.06506217
## 4     4  0.46704407 -0.46953799 -0.4622504 -0.46484293 -0.46704407
## 5     5  0.61116284 -0.61193242 -0.7056092 -0.60955334 -0.61116284
## 6     6  0.61452834 -0.61365379 -0.6946173 -0.61451087 -0.61452834
## 7     7  0.61373915 -0.61123086 -0.6756582 -0.61535120 -0.61373915
## 8     8  0.61227751 -0.60814169 -0.6554146 -0.61552965 -0.61227751
```

```
###Graphically
ggplot(criterion_std,aes(model))+
  geom_line(aes(y=Adj.R2,colour="Adj.R2"))+
  geom_line(aes(y=Cp,colour="Cp"))+
  geom_line(aes(y=BIC,colour="BIC"))+
  geom_line(aes(y=RSS,colour="RSS"))+
  geom_line(aes(y=MS_Res,colour="MS_Res"))+
  theme_minimal()
```



###Interpretation

• There are two methods to find the better model 1) Formal model : Using the values of above criteria, the better model should have maximum value for adjusted R^2 and minimum values for Cp, BIC, RSS and MS_Res. Therefore according to the above values 5th model is the better model. 2) Graphical method According to the plot, 5th model has maximum value for adjusted R^2 and minimum values for Cp, BIC, RSS and MS_Res. Therefore 5th model seems a better model.

```r
##coefficients

coef(fit_frwd,5)
```

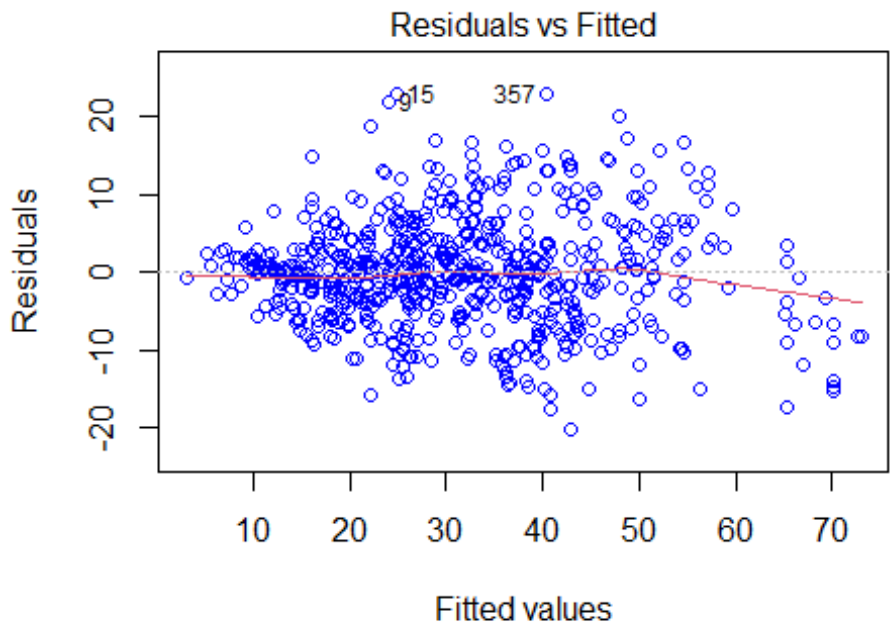
```
##        (Intercept)             Cement Blast_Furnace_Slag
Fly_Ash
##        23.08477042         0.10563515         0.08023026
0.04831116
##              Water            Age_day
##        -0.22719997         0.55235730
```

```r
model_1<-
lm(Concrete_compressive_strength~Cement+Blast_Furnace_Slag+Fly_Ash+Water+Age_
day,data = cleaned_data)
summary(model_1)
```

```
##
## Call:
## lm(formula = Concrete_compressive_strength ~ Cement + Blast_Furnace_Slag +
##     Fly_Ash + Water + Age_day, data = cleaned_data)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -20.0528  -4.1168  -0.1946   3.7212  22.8502
##
## Coefficients:
##                      Estimate Std. Error t value Pr(>|t|)
## (Intercept)        23.084770   3.340424   6.911 1.04e-11 ***
## Cement              0.105635   0.003238  32.629  < 2e-16 ***
## Blast_Furnace_Slag  0.080230   0.003596  22.309  < 2e-16 ***
## Fly_Ash             0.048311   0.005120   9.436  < 2e-16 ***
## Water              -0.227200   0.015429 -14.726  < 2e-16 ***
## Age_day             0.552357   0.017094  32.312  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.88 on 737 degrees of freedom
## Multiple R-squared:  0.7916, Adjusted R-squared:  0.7902
## F-statistic:   560 on 5 and 737 DF,  p-value: < 2.2e-16
```

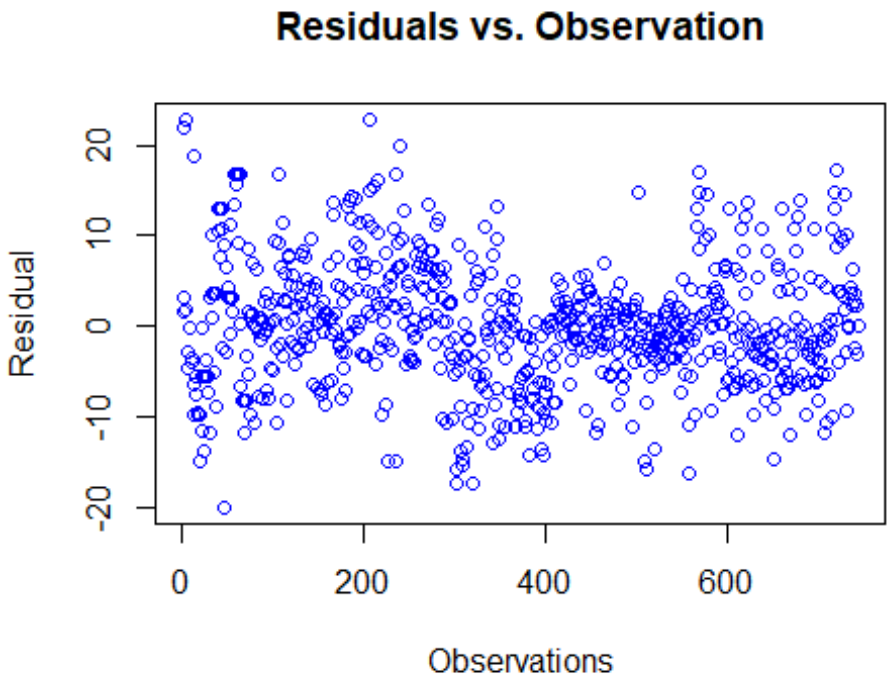
##Interpretation ###############With Leverage points

```r
##With Leverage points
##Check for Homoscedasticity using residuals vs fitted values plot.

plot(model_1,which = 1,col=c("blue"))
```

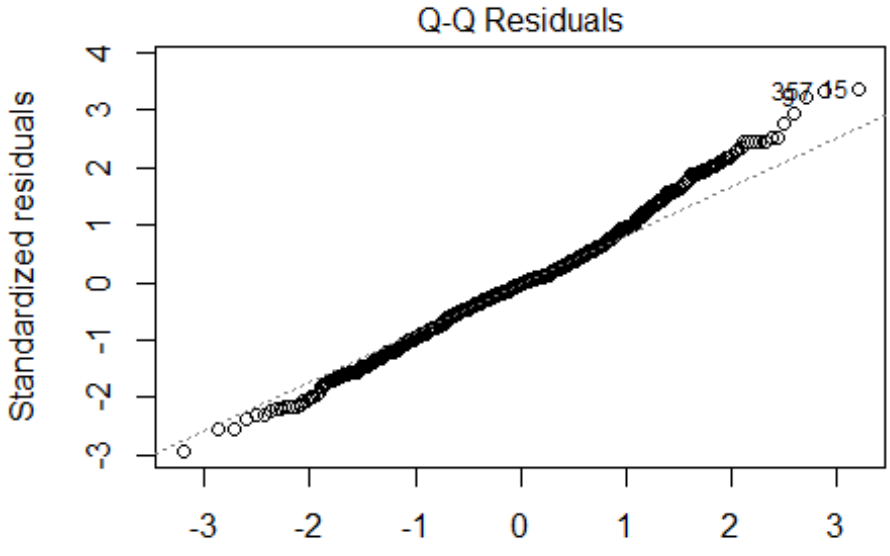


oncrete_compressive_strength ~ Cement + Blast_Furnace_Slag + Fly

```
##With Leverage points
##Check for Independent or dependent using residuals vs Observation value
plot.

res <- data.frame(res = resid(model_1))
avp <- cbind(cleaned_data, res)
plot(1:nrow(avp), avp$res,
 main = "Residuals vs. Observation",
 xlab = "Observations",
 ylab = "Residual",
 col = "blue")
```

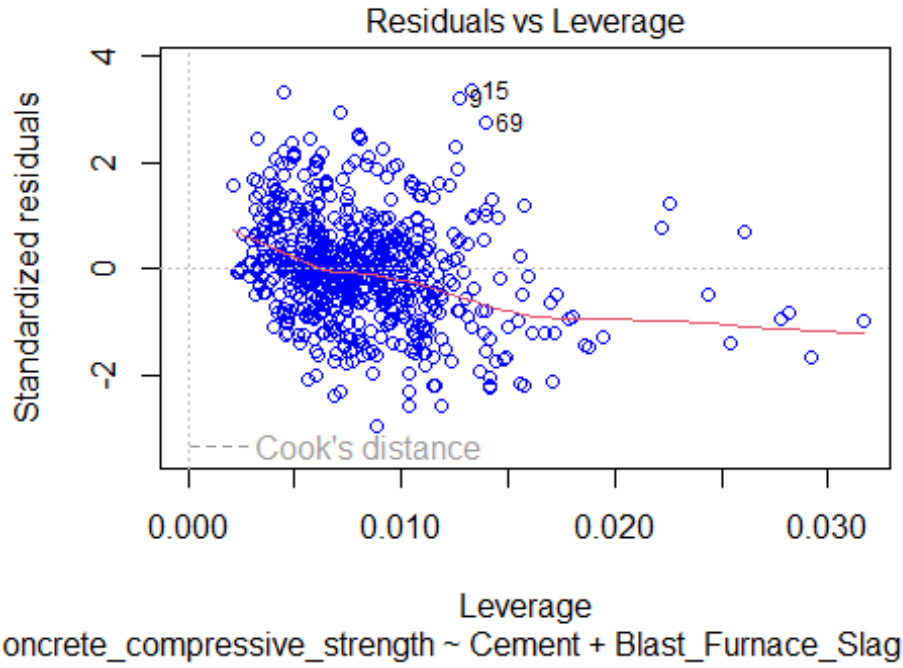



```
##With Leverage points
###Check the normality of residuals.(using QQ plot)
plot(model_1,which = 2,col=c("black"))
```



oncrete_compressive_strength ~ Cement + Blast_Furnace_Slag + Fly

```
##With Leverage points
###Check the residual vs Leverage.
plot(model_1,which = 5,col=c("blue"))
```



oncrete_compressive_strength ~ Cement + Blast_Furnace_Slag + Fly

###############Without Leverage points

```
##Check the Leverage points


leverage<-hatvalues(model_1)
high_leverage<-which(leverage>2*(6+1)/nrow(cleaned_data))
high_leverage
```

```
## 378 500 501 502 503 504 505 506 507 924
## 224 324 325 326 327 328 329 330 331 643
```

```
cleaned_dataset <- cleaned_data[-high_leverage, ]



nrow(cleaned_dataset)
```

```
## [1] 733
```

##Removing Leverage points

```
better_model<-
lm(Concrete_compressive_strength~Cement+Blast_Furnace_Slag+Fly_Ash+Water+Age_
```

```
day,data = cleaned_dataset)
summary(better_model)

##
## Call:
## lm(formula = Concrete_compressive_strength ~ Cement + Blast_Furnace_Slag +
##     Fly_Ash + Water + Age_day, data = cleaned_dataset)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -20.1263  -4.0706  -0.2408   3.7504  22.9424
##
## Coefficients:
##                     Estimate Std. Error t value Pr(>|t|)
## (Intercept)        20.769914   3.615727   5.744 1.36e-08 ***
## Cement              0.108082   0.003508  30.813  < 2e-16 ***
## Blast_Furnace_Slag  0.080753   0.003657  22.082  < 2e-16 ***
## Fly_Ash             0.050592   0.005417   9.340  < 2e-16 ***
## Water              -0.218714   0.016234 -13.473  < 2e-16 ***
## Age_day             0.552769   0.017342  31.875  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 6.87 on 727 degrees of freedom
## Multiple R-squared:  0.7912, Adjusted R-squared:  0.7897
## F-statistic: 550.8 on 5 and 727 DF,  p-value: < 2.2e-16
```

###Interpretation

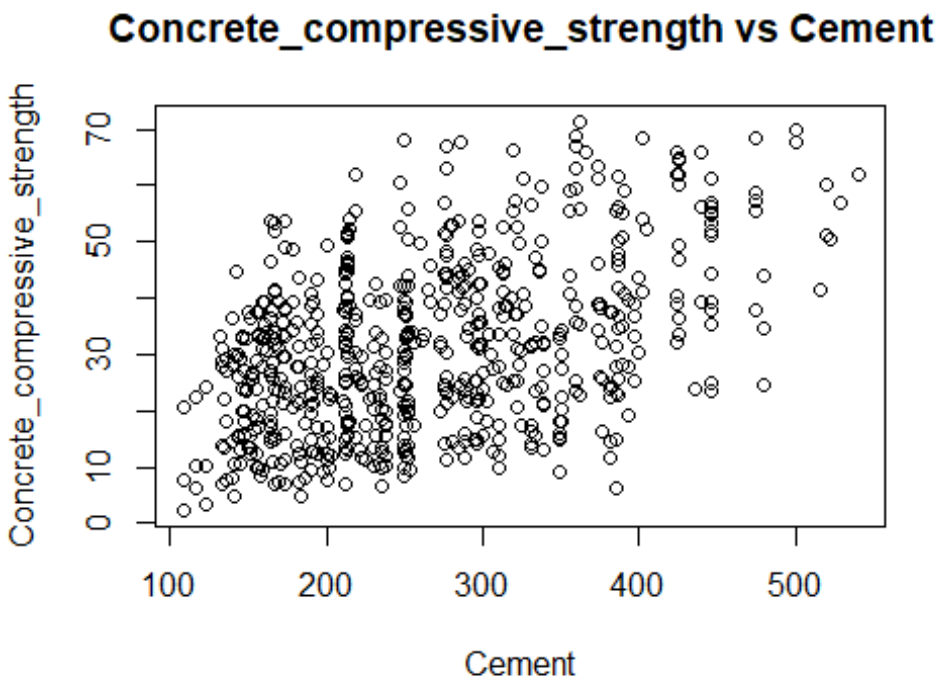
###Interpretation Now all are the significant. *Residual Standard Error (RSE) This indicates that the average distance of the observed values from the predicted values is about 6.87 units of Concrete Compressive Strength. A lower RSE suggests a better fit of the model to the data.* R-Squared Approximately 79.12% of the variability in Concrete Compressive Strength can be explained by the model that includes cement, Blast furnace slag, fly ash, water,age day. *Adjusted R-Squared An adjusted R-Squared of 78.97% indicates that the model still explains a substantial amount of variance in Concrete Compressive Strength consider the number of predictors.

H0: The regression model is not significant. H1: The regression model is significant.

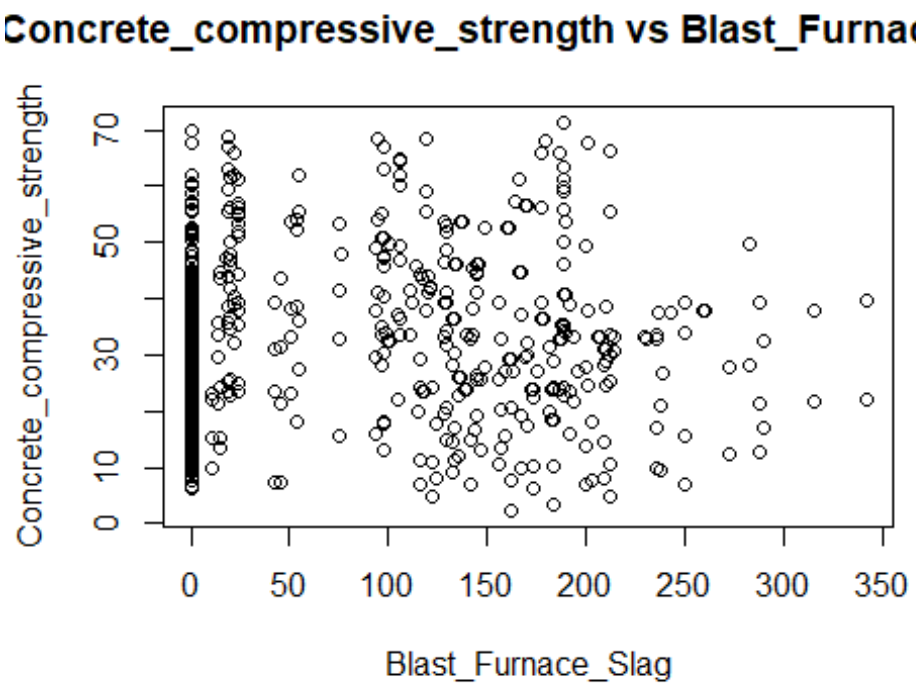
p-value: < 2.2e-16<0.05 We have sufficient evidence to reject the null hypothesis. Concluding that at least one of the predictors in the model significantly contributes to explaining the variability the variability in Concrete Compressive Strength.

```
###Model diagnostics

##Without Leverage points
##Check the linearity using scatter plots.

#Concrete_compressive_strength vs Cement
```

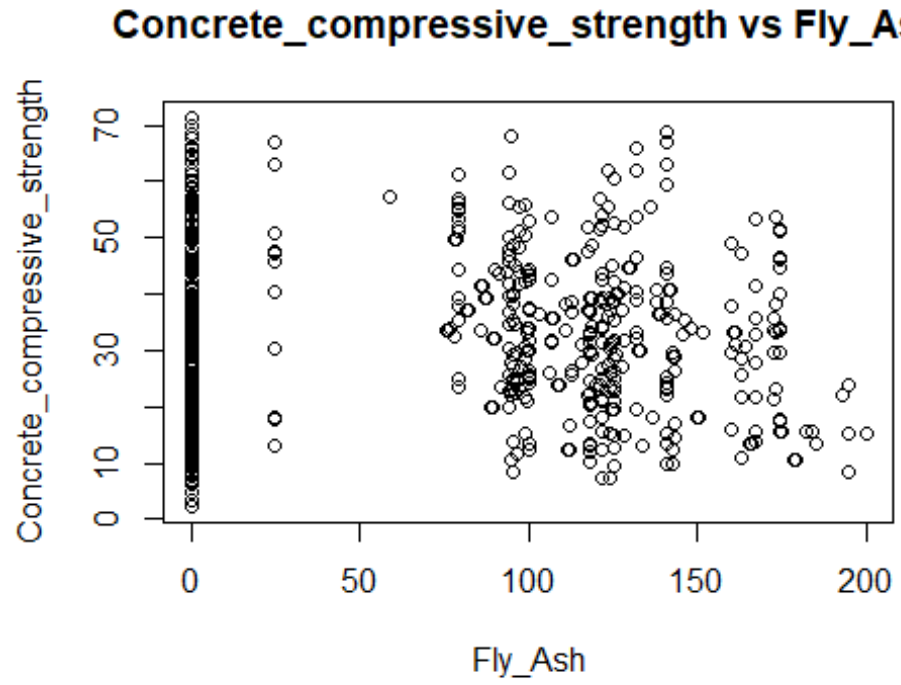
```r
plot(Concrete_compressive_strength~Cement,data =
cleaned_dataset,main="Concrete_compressive_strength vs Cement")
```



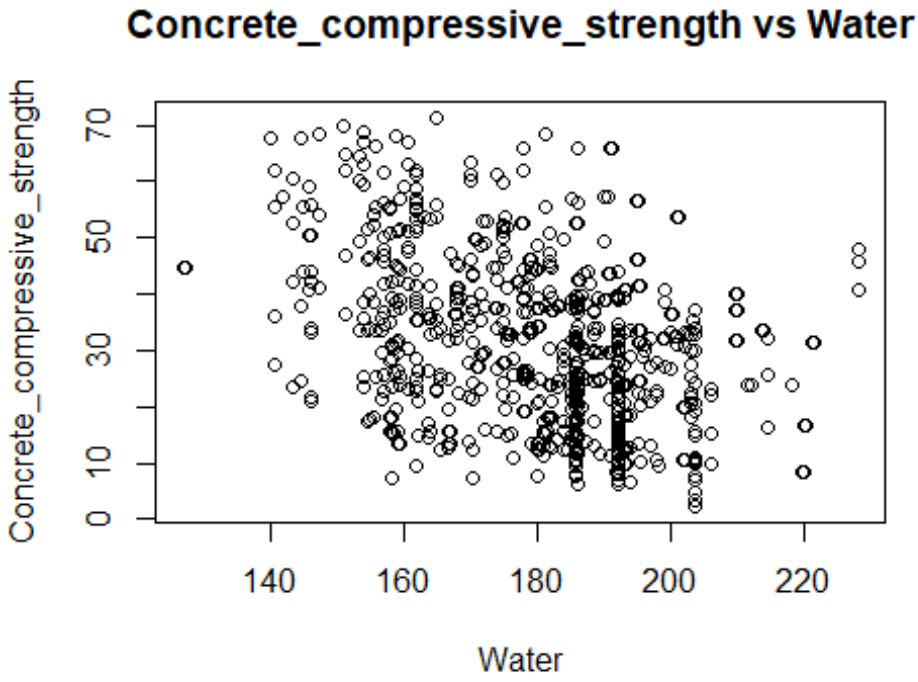

```r
#Concrete_compressive_strength vs Blast_Furnace_Slag
plot(Concrete_compressive_strength~Blast_Furnace_Slag,data
=cleaned_dataset,main="Concrete_compressive_strength vs Blast_Furnace_Slag")
```



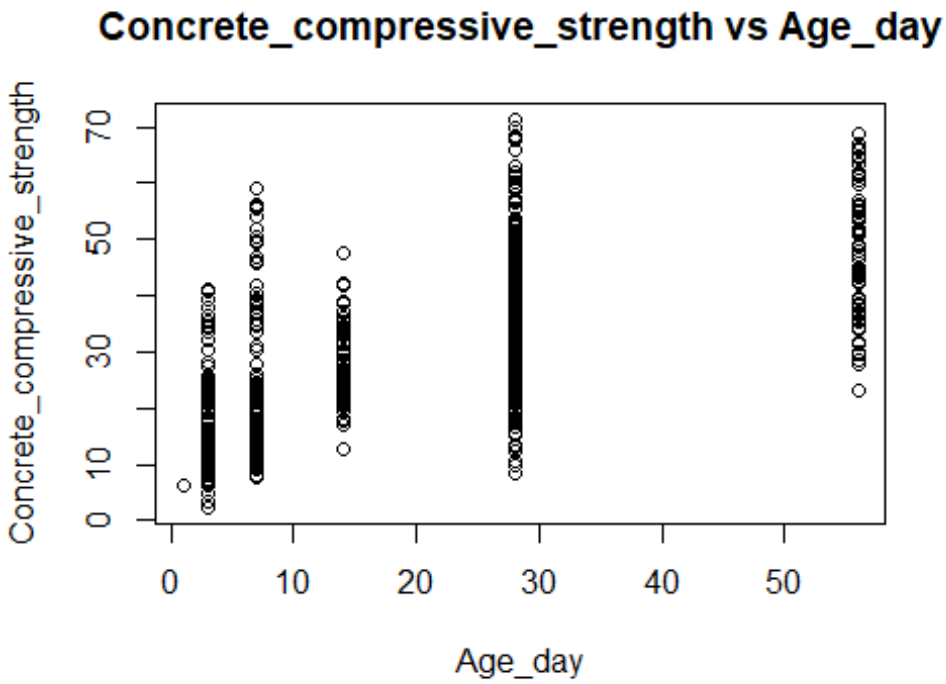

```r
#Concrete_compressive_strength vs Fly_Ash
plot(Concrete_compressive_strength~Fly_Ash,data =
cleaned_dataset,main="Concrete_compressive_strength vs Fly_Ash")
```



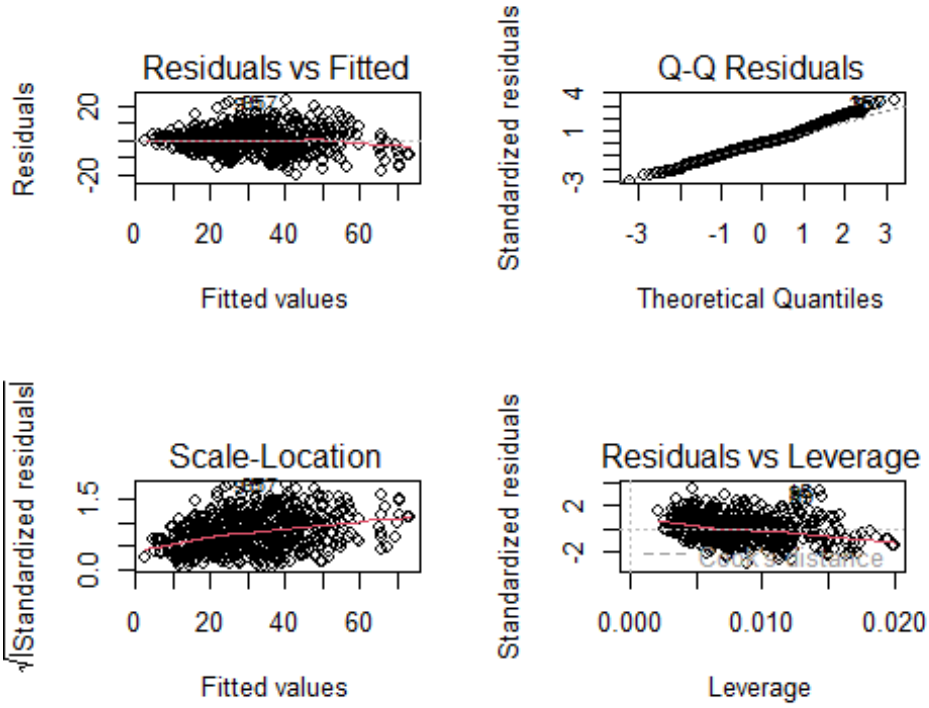
```r
#Concrete_compressive_strength vs Water
plot(Concrete_compressive_strength~Water,data =
cleaned_dataset,main="Concrete_compressive_strength vs Water")
```



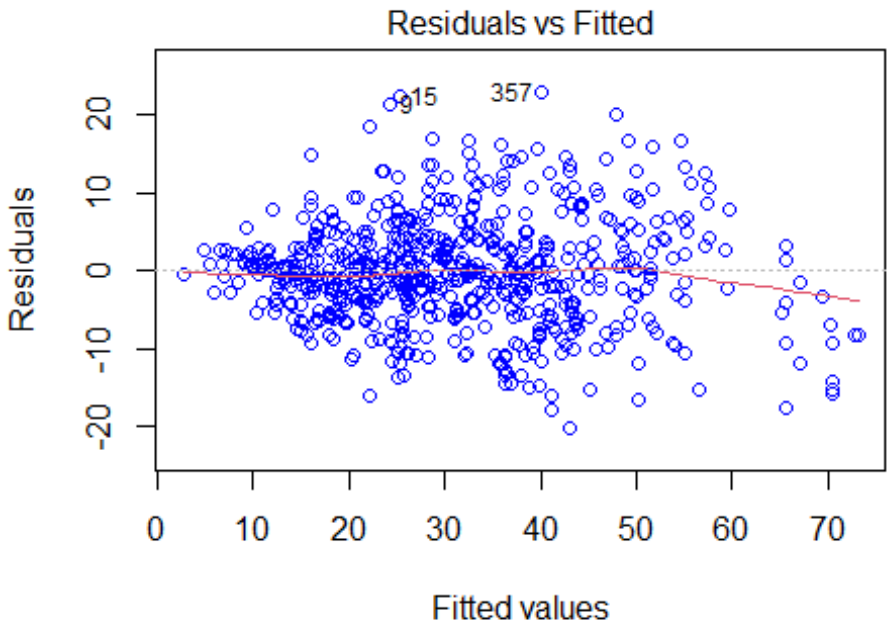

```r
#Concrete_compressive_strength vs Age_day
plot(Concrete_compressive_strength~Age_day,data =
cleaned_dataset,main="Concrete_compressive_strength vs Age_day")
```




```
par(mfrow=c(2,2))
plot(better_model)
```



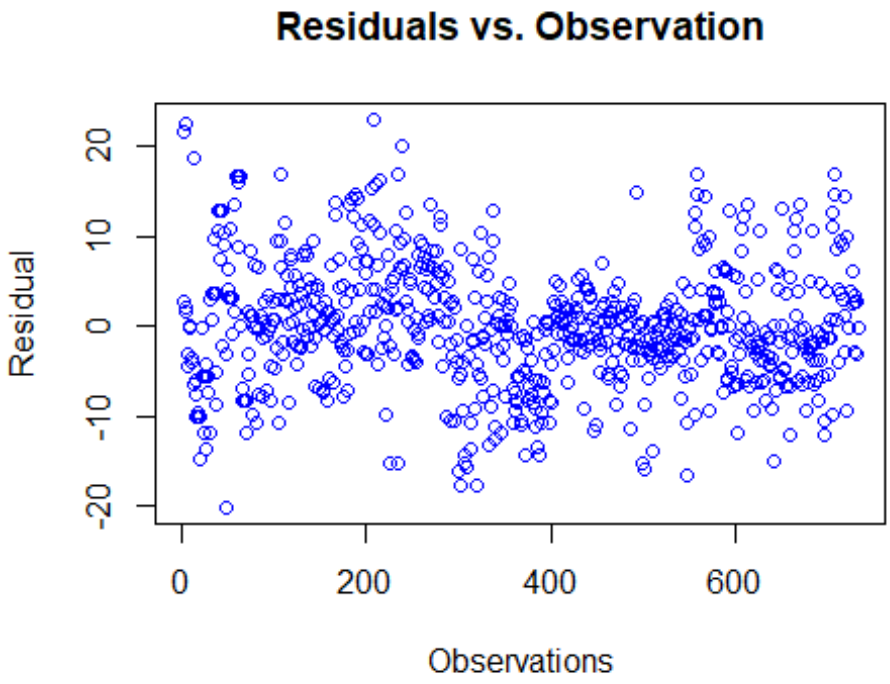
```r
##Without Leverage points
##Check for Homoscedasticity using residuals vs fitted values plot.

plot(better_model,which = 1,col=c("blue"))
```



oncrete_compressive_strength ~ Cement + Blast_Furnace_Slag + Fly ###Interpretation

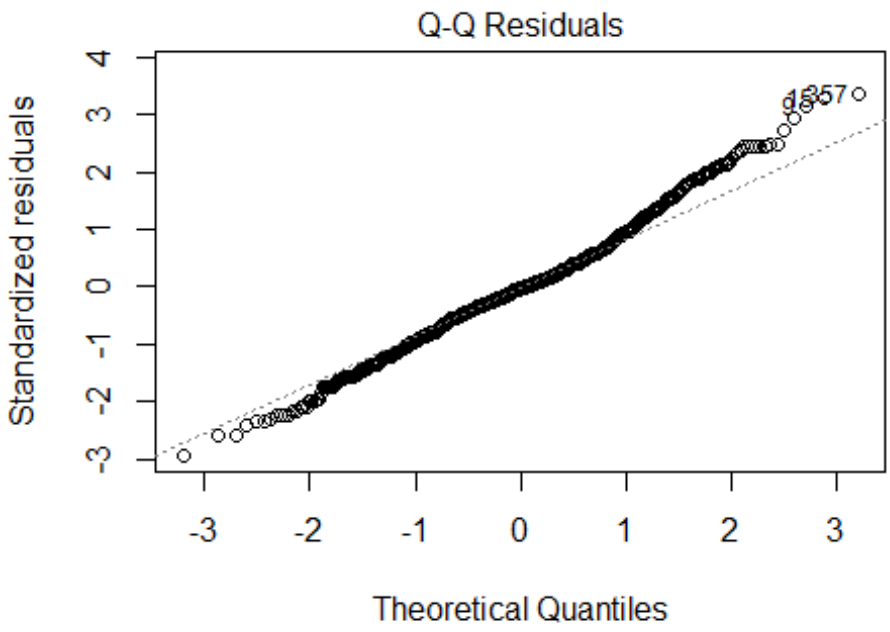
The residuals appear to be scattered randomly around 0, which suggests that the relationship is likely linear. However, there seems to be some minor clustering, indicating potential non-constant variance (heteroscedasticity), though it's not severe. It seems that the fitted values are contain the constant variance. Then the homoscedasticity property hold.

```r
##Without Leverage points
##Check for Independent or dependent using residuals vs Observation value plot.

res <- data.frame(res = resid(better_model))
avp <- cbind(cleaned_dataset, res)
plot(1:nrow(avp), avp$res,
 main = "Residuals vs. Observation",
 xlab = "Observations",
 ylab = "Residual",
 col = "blue")
```



It seems that the errors are uncorrelated.

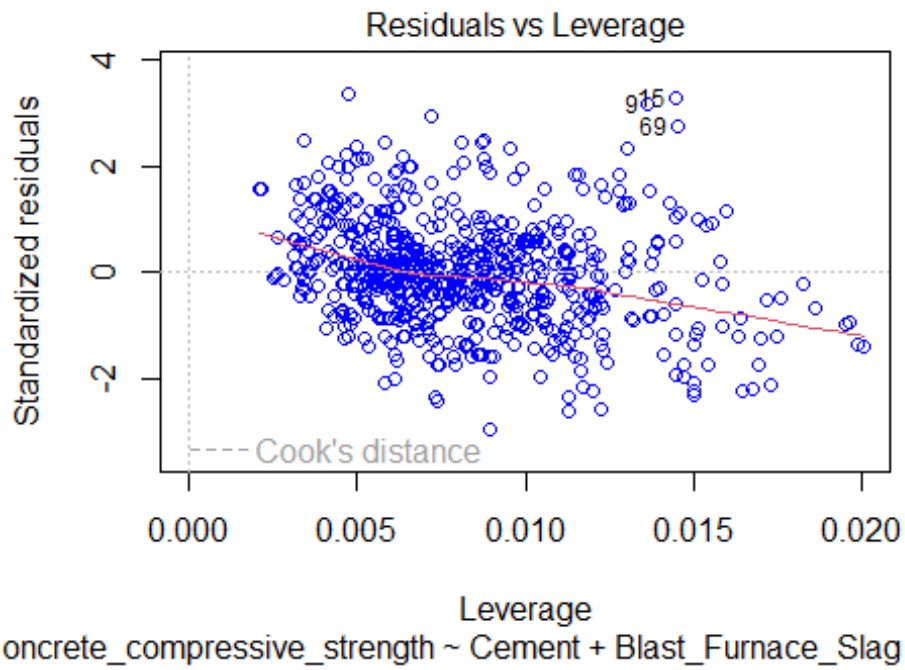
```
##Without Leverage points
###Check the normality of residuals.(using QQ plot)
plot(better_model,which = 2,col=c("black"))
```



oncrete_compressive_strength ~ Cement + Blast_Furnace_Slag + Fly The maximum points fall approximately along the reference line. Therefore the residuals are normally distributed

##Interpretation

```
##Without Leverage points
###Check the residual vs Leverage.
plot(better_model,which = 5,col=c("blue"))
```



oncrete_compressive_strength ~ Cement + Blast_Furnace_Slag + Fly

##Interpretation Most points are clustered near the bottom, indicating that no data points exert an undue amount of leverage on the model. However, some points like 915 and 835 might be influential as they are close to the Cook's distance line.

```
##########Multicollinearity##############

vif_values<-vif(better_model)
vif_values

##             Cement Blast_Furnace_Slag            Fly_Ash
Water
##           1.680260           1.492459           1.877983
1.199101
##            Age_day
##           1.057169
```