

DS311 - R Lab Assignment

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R Assignment 1

- In this assignment, we are going to apply some of the build in data set in R for descriptive statistics analysis.
- To earn full grade in this assignment, students need to complete the coding tasks for each question to get the result.
- After finished all the questions, knit the document into HTML format for submission.

Question 1

Using the **mtcars** data set in R, please answer the following questions.

```
# Loading the data  
data(mtcars)
```

```
# Head of the data set  
head(mtcars)
```

```
##           mpg  cyl  disp  hp  drat    wt   qsec vs  am  gear  carb  
## Mazda RX4      21.0   6  160 110 3.90 2.620 16.46 0   1    4    4  
## Mazda RX4 Wag  21.0   6  160 110 3.90 2.875 17.02 0   1    4    4  
## Datsun 710      22.8   4  108  93 3.85 2.320 18.61 1   1    4    1  
## Hornet 4 Drive  21.4   6  258 110 3.08 3.215 19.44 1   0    3    1  
## Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02 0   0    3    2  
## Valiant        18.1   6  225 105 2.76 3.460 20.22 1   0    3    1
```

- a. Report the number of variables and observations in the data set.

```
# Enter your code here!  
dim(mtcars)
```

```
## [1] 32 11
```

```
# Answer:  
print("There are total of 11 variables and 32 observations in this data set.")
```

```
## [1] "There are total of 11 variables and 32 observations in this data set."
```

- b. Print the summary statistics of the data set and report how many discrete and continuous variables are in the data set.

```
# Enter your code here!
summary(mtcars)
```

```
##      mpg          cyl          disp          hp
##  Min.   :10.40   Min.    :4.000   Min.    : 71.1   Min.    : 52.0
##  1st Qu.:15.43   1st Qu.:4.000   1st Qu.:120.8   1st Qu.: 96.5
##  Median :19.20   Median :6.000   Median :196.3   Median :123.0
##  Mean   :20.09   Mean    :6.188   Mean    :230.7   Mean    :146.7
##  3rd Qu.:22.80   3rd Qu.:8.000   3rd Qu.:326.0   3rd Qu.:180.0
##  Max.   :33.90   Max.    :8.000   Max.    :472.0   Max.    :335.0
##      drat          wt          qsec          vs
##  Min.   :2.760   Min.    :1.513   Min.    :14.50   Min.    :0.0000
##  1st Qu.:3.080   1st Qu.:2.581   1st Qu.:16.89   1st Qu.:0.0000
##  Median :3.695   Median :3.325   Median :17.71   Median :0.0000
##  Mean   :3.597   Mean    :3.217   Mean    :17.85   Mean    :0.4375
##  3rd Qu.:3.920   3rd Qu.:3.610   3rd Qu.:18.90   3rd Qu.:1.0000
##  Max.   :4.930   Max.    :5.424   Max.    :22.90   Max.    :1.0000
##      am          gear          carb
##  Min.   :0.0000   Min.    :3.000   Min.    :1.000
##  1st Qu.:0.0000   1st Qu.:3.000   1st Qu.:2.000
##  Median :0.0000   Median :4.000   Median :2.000
##  Mean   :0.4062   Mean    :3.688   Mean    :2.812
##  3rd Qu.:1.0000   3rd Qu.:4.000   3rd Qu.:4.000
##  Max.   :1.0000   Max.    :5.000   Max.    :8.000
```

```
# Answer:
print("There are 5 discrete variables and 6 continuous variables in this data set.")
```

```
## [1] "There are 5 discrete variables and 6 continuous variables in this data set."
```

- c. Calculate the mean, variance, and standard deviation for the variable **mpg** and assign them into variable names **m**, **v**, and **s**. Report the results in the print statement.

```
# Enter your code here!
```

```
mpg <- mtcars$mpg
m <- mean(mpg)
v <- var(mpg)
s <- sqrt(v)
# print
print(paste("The average of Mile Per Gallon from this data set is ", m, " with variance ", v, " and s ", s))
```

```
## [1] "The average of Mile Per Gallon from this data set is 20.090625 with variance 36.324102822580096 and s 6.026646395894112"
```

- d. Create two tables to summarize 1) average mpg for each cylinder class and 2) the standard deviation of mpg for each gear class.

```
# Enter your code here!
```

```
cyl <- mtcars$cyl
gear <- mtcars$gear
# table
aggregate(mpg ~ cyl, mtcars, mean)
```

```
##   cyl      mpg
## 1   4 26.66364
## 2   6 19.74286
## 3   8 15.10000
```

```
aggregate(mpg ~ gear, mtcars, sd)
```

```
##   gear      mpg
## 1    3 3.371618
## 2    4 5.276764
## 3    5 6.658979
```

- e. Create a crosstab that shows the number of observations belong to each cylinder and gear class combinations. The table should show how many observations given the car has 4 cylinders with 3 gears, 4 cylinders with 4 gears, etc. Report which combination is recorded in this data set and how many observations for this type of car.

```
# Enter your code here!
table(cyl, gear)
```

```
##   gear
## cyl  3  4  5
##   4  1  8  2
##   6  2  4  1
##   8 12  0  2
```

```
print("The most common car type in this data set is car with 8 cylinders and 3 gears. There are total o
```

```
## [1] "The most common car type in this data set is car with 8 cylinders and 3 gears. There are total o
```

Question 2

Use different visualization tools to summarize the data sets in this question.

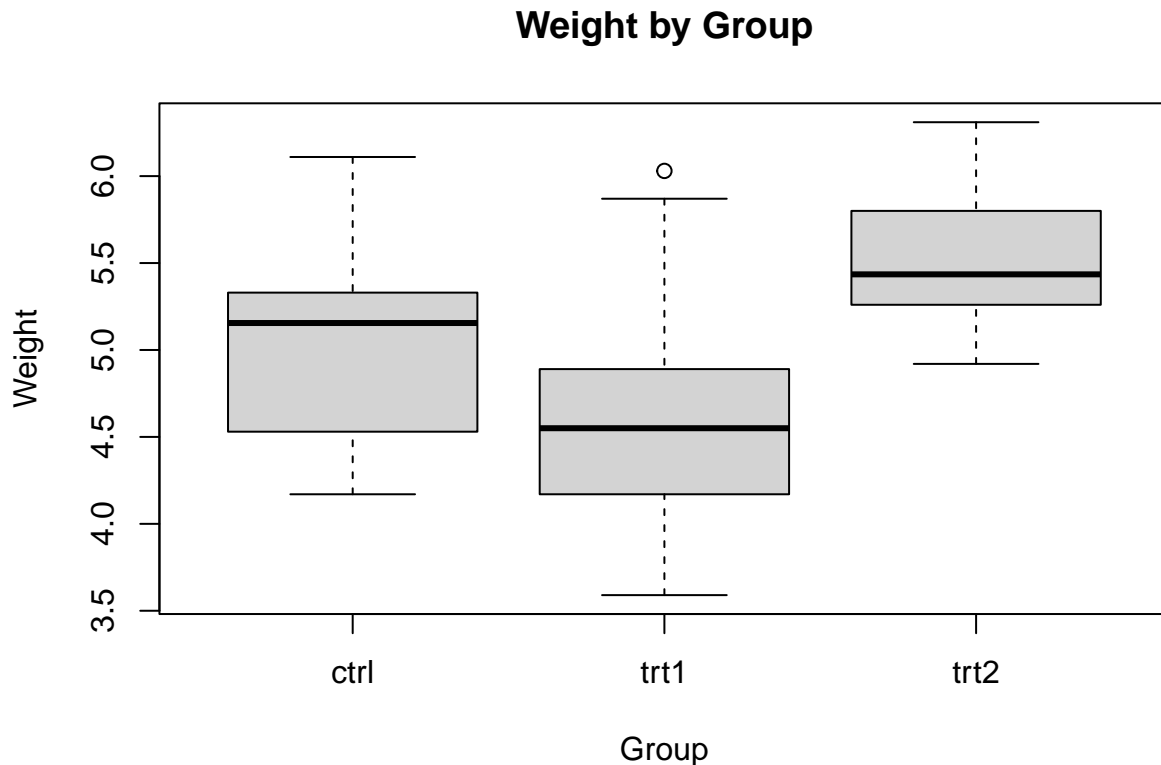
- a. Using the **PlantGrowth** data set, visualize and compare the weight of the plant in the three separated group. Give labels to the title, x-axis, and y-axis on the graph. Write a paragraph to summarize your findings.

```
# Load the data set
data("PlantGrowth")

# Head of the data set
head(PlantGrowth)
```

```
##   weight group
## 1   4.17  ctrl
## 2   5.58  ctrl
## 3   5.18  ctrl
## 4   6.11  ctrl
## 5   4.50  ctrl
## 6   4.61  ctrl
```

```
# Enter your code here!
boxplot(weight ~ group, data = PlantGrowth,
        xlab = "Group", ylab = "Weight",
        main = "Weight by Group")
```



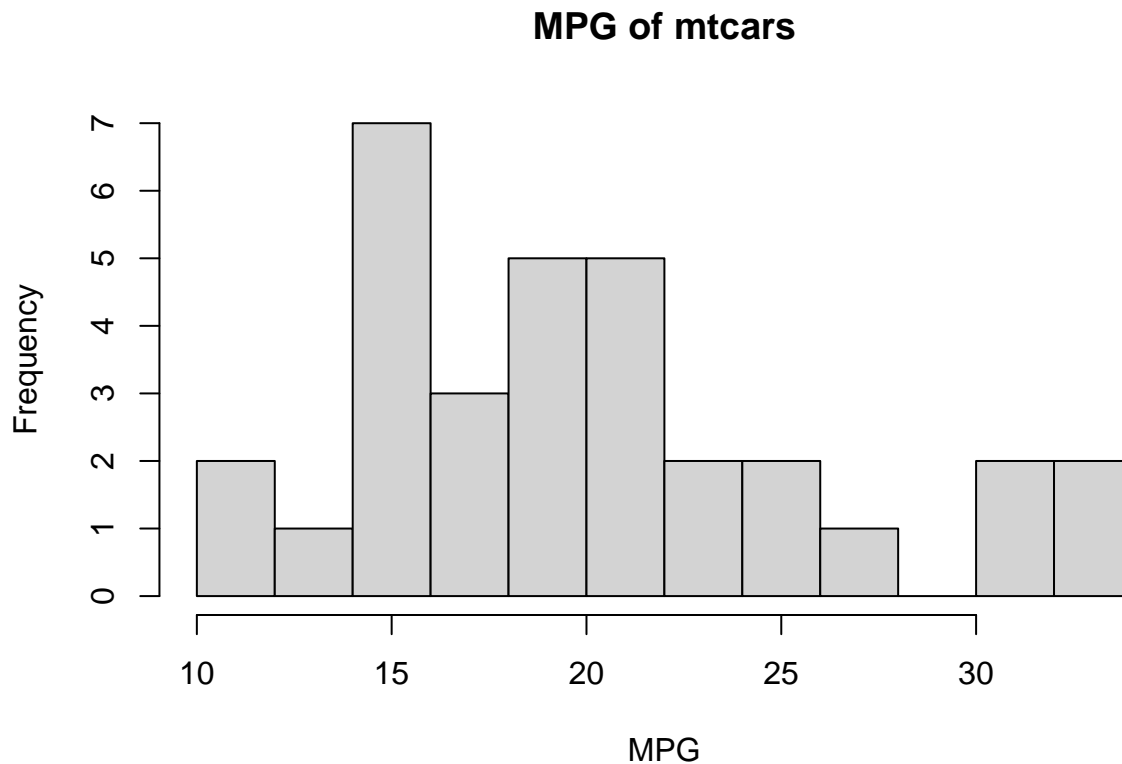
Result:

=> Report a paragraph to summarize your findings from the plot!

In this box plot, the median of each group is quite different. We see that the control group has a higher median than the two treated ones, and treatment 1 has a higher median than treatment 2. We also see that the first treatment has more variability in weight compared to the other 2, having a noticeable outlier. So the different fertilizer treatments do have an effect, but depending on what you desire, treatment 2 would be a good fertilizer to use, because the plants have a higher weight despite having a lower median.

- b. Using the **mtcars** data set, plot the histogram for the column **mpg** with 10 breaks. Give labels to the title, x-axis, and y-axis on the graph. Report the most observed mpg class from the data set.

```
hist(mpg, breaks = 10, main = "MPG of mtcars", xlab = "MPG", ylab = "Frequency")
```



```
print("Most of the cars in this data set are in the class of 15 mile per gallon.")
```

```
## [1] "Most of the cars in this data set are in the class of 15 mile per gallon."
```

- c. Using the **USArrests** data set, create a pairs plot to display the correlations between the variables in the data set. Plot the scatter plot with **Murder** and **Assault**. Give labels to the title, x-axis, and y-axis on the graph. Write a paragraph to summarize your results from both plots.

```
# Load the data set
data("USArrests")

# Head of the data set
head(USArrests)
```

```
##           Murder Assault UrbanPop Rape
## Alabama      13.2    236      58 21.2
## Alaska       10.0    263      48 44.5
## Arizona       8.1    294      80 31.0
## Arkansas      8.8    190      50 19.5
## California    9.0    276      91 40.6
## Colorado      7.9    204      78 38.7
```

```
# Enter your code here!
murder <- USArrests$Murder
assault <- USArrests$Assault
plot(murder, assault, xlab = "Murder", ylab = "Assault", main = "Murder and Assault Arrests")
abline(lm(assault ~ murder), col = "darkorchid")
```



Result:

=> Report a paragraph to summarize your findings from the plot!

As murder arrests increases, so does assault arrests. We see that there is a positive correlation between these two variables. There are also plenty of points that stray from the line. Some of them show that assault is high when murder is low and vice versa, but considering this dataset has 1973 statistics on murder, assault, and rape arrests per 100,000 population in each of the 50 states, there will be variability across each state.

Question 3

Download the housing data set from www.jaredlander.com and find out what explains the housing prices in New York City.

Note: Check your working directory to make sure that you can download the data into the data folder.

- a. Create your own descriptive statistics and aggregation tables to summarize the data set and find any meaningful results between different variables in the data set.

```
# Head of the cleaned data set
head(housingData)
```

```
##      Neighborhood Market.Value.per.SqFt      Boro Year.Built
## 1      FINANCIAL          200.00 Manhattan    1920
## 2      FINANCIAL          242.76 Manhattan    1985
## 4      FINANCIAL          271.23 Manhattan    1930
## 5      TRIBECA           247.48 Manhattan    1985
## 6      TRIBECA           191.37 Manhattan    1986
## 7      TRIBECA           211.53 Manhattan    1985
```

```
# Enter your code here!
```

```
neighbor <- as.factor(housingData$Neighborhood)
market <- housingData$Market.Value.per.SqFt
boro <- as.factor(housingData$Boro)
year <- housingData$Year.Built
# summary
summary(housingData)
```

```
##      Neighborhood      Market.Value.per.SqFt      Boro      Year.Built
##      Length:2530      Min.   : 10.66      Length:2530      Min.   :1825
##      Class :character      1st Qu.: 75.10      Class :character      1st Qu.:1926
##      Mode  :character      Median :114.89      Mode  :character      Median :1986
##                               Mean   :133.17      Mean   :1967
##                               3rd Qu.:189.91      3rd Qu.:2005
##                               Max.    :399.38      Max.    :2010
```

```
summary(neighbor)
```

```
##      FLUSHING-NORTH      UPPER EAST SIDE (59-79)      HARLEM-CENTRAL
##      133      123      94
##      CHELSEA      UPPER WEST SIDE (59-79)      UPPER EAST SIDE (79-96)
##      88      87      78
##      TRIBECA      UPPER WEST SIDE (79-96)      GREENWICH VILLAGE-CENTRAL
##      74      66      60
##      WILLIAMSBURG-CENTRAL      BEDFORD STUYVESANT      GREENWICH VILLAGE-WEST
##      60      58      57
##      MIDTOWN EAST      ELMHURST      SOHO
##      56      55      55
##      MIDTOWN WEST      FLATIRON      LOWER EAST SIDE
##      47      45      42
##      MURRAY HILL      WILLIAMSBURG-EAST      FINANCIAL
##      39      38      36
##      HARLEM-EAST      BOROUGH PARK      UPPER WEST SIDE (96-116)
##      36      35      34
##      WILLIAMSBURG-SOUTH      CLINTON      PARK SLOPE
##      34      31      31
##      ASTORIA      REGO PARK      SHEEPSHEAD BAY
##      30      27      27
##      EAST VILLAGE      WILLIAMSBURG-NORTH      ALPHABET CITY
##      26      26      24
```

##	LONG ISLAND CITY	CIVIC CENTER	MANHATTAN VALLEY
##	24	23	23
##	SUNSET PARK	BRIGHTON BEACH	CHINATOWN
##	23	21	21
##	JACKSON HEIGHTS	GRAVESEND	GREENPOINT
##	21	19	19
##	MADISON	CORONA	FOREST HILLS
##	19	17	17
##	GRAMERCY	RIVERDALE	MORRISANIA/LONGWOOD
##	17	17	16
##	BOERUM HILL	FASHION	CROWN HEIGHTS
##	15	15	14
##	DOWNTOWN-FULTON FERRY	CLINTON HILL	KIPS BAY
##	14	13	13
##	LITTLE ITALY	MIDTOWN CBD	HARLEM-UPPER
##	13	13	12
##	MIDWOOD	SUNNYSIDE	FORT GREENE
##	11	11	10
##	KEW GARDENS	OCEAN HILL	PARK SLOPE SOUTH
##	10	10	10
##	BAYSIDE	BROOKLYN HEIGHTS	CARROLL GARDENS
##	9	9	9
##	NEW SPRINGVILLE	OCEAN PARKWAY-NORTH	SOUTHBRIDGE
##	9	9	9
##	BAY RIDGE	COBBLE HILL-WEST	FLATBUSH-NORTH
##	8	8	8
##	FLUSHING-SOUTH	WOODSIDE	BENSONHURST
##	8	8	7
##	MIDDLE VILLAGE	BATH BEACH	EAST NEW YORK
##	7	6	6
##	FLATBUSH-CENTRAL	SOUNDVIEW	WASHINGTON HEIGHTS UPPER
##	6	6	6
##	COBBLE HILL	HAMMELS	HOWARD BEACH
##	5	5	5
##	JAMAICA	KINGSBRIDGE/JEROME PARK	PROSPECT HEIGHTS
##	5	5	5
##	ROCKAWAY PARK	UPPER EAST SIDE (96-110)	WASHINGTON HEIGHTS LOWER
##	5	5	5
##	WINDSOR TERRACE	BRIARWOOD	CANARSIE
##	5	4	4
##	CONEY ISLAND	FAR ROCKAWAY	MASPETH
##	4	4	4
##	WOODHAVEN	BRONXDALE	COLLEGE POINT
##	4	3	3
##	(Other)		
##	79		

summary(boro)

##	Bronx	Brooklyn	Manhattan	Queens	Staten Island
##	69	626	1379	432	24


```
# table
aggregate(market, by = list(boro), FUN = function(x) c(mean = mean(x), sd = sd(x)))
```

```
##      Group.1      x.mean      x.sd
## 1      Bronx  47.932319 15.076589
## 2    Brooklyn 80.134393 22.910773
## 3    Manhattan 180.592647 56.098065
## 4      Queens  77.381366 30.775835
## 5 Staten Island 41.269583  6.792886
```

```
table(neighbor)
```

```
## neighbor
##      ALPHABET CITY      ARROCHAR-SHORE ACRES      ASTORIA
##              24              1              30
##      BATH BEACH      BAY RIDGE      BAYSIDE
##              6              8              9
##      BEDFORD PARK/NORWOOD      BEDFORD STUYVESANT      BELMONT
##              2              58              1
##      BENSONHURST      BERGEN BEACH      BOERUM HILL
##              7              1              15
##      BOROUGH PARK      BRIARWOOD      BRIGHTON BEACH
##              35              4              21
##      BRONX-UNKNOWN      BRONXDALE      BROOKLYN HEIGHTS
##              2              3              9
##      BUSH TERMINAL      BUSHWICK      CANARSIE
##              1              2              4
##      CARROLL GARDENS      CHELSEA      CHINATOWN
##              9              88              21
##      CITY ISLAND      CIVIC CENTER      CLINTON
##              1              23              31
##      CLINTON HILL      COBBLE HILL      COBBLE HILL-WEST
##              13              5              8
##      COLLEGE POINT      CONEY ISLAND      CORONA
##              3              4              17
##      CROWN HEIGHTS      DOWNTOWN-FULTON FERRY      DOWNTOWN-FULTON MALL
##              14              14              2
##      DOWNTOWN-METROTECH      DYKER HEIGHTS      EAST NEW YORK
##              3              1              6
##      EAST TREMONT      EAST VILLAGE      ELMHURST
##              3              26              55
##      FAR ROCKAWAY      FASHION      FINANCIAL
##              4              15              36
##      FLATBUSH-CENTRAL      FLATBUSH-LEFFERTS GARDEN      FLATBUSH-NORTH
##              6              1              8
##      FLATIRON      FLUSHING-NORTH      FLUSHING-SOUTH
##              45              133              8
##      FLUSHING MEADOW PARK      FOREST HILLS      FORT GREENE
##              1              17              10
##      GLENDALE      GOWANUS      GRAMERCY
##              3              3              17
##      GRANT CITY      GRAVESEND      GREAT KILLS
```

##	2	19	1
##	GREENPOINT	GREENWICH VILLAGE-CENTRAL	GREENWICH VILLAGE-WEST
##	19	60	57
##	GRYMES HILL	HAMMELS	HARLEM-CENTRAL
##	1	5	94
##	HARLEM-EAST	HARLEM-UPPER	HARLEM-WEST
##	36	12	2
##	HIGHBRIDGE/MORRIS HEIGHTS	HILLCREST	HOLLIS
##	1	1	1
##	HOWARD BEACH	INWOOD	JACKSON HEIGHTS
##	5	2	21
##	JAMAICA	JAMAICA ESTATES	JAVITS CENTER
##	5	2	1
##	KENSINGTON	KEW GARDENS	KINGSBRIDGE HTS/UNIV HTS
##	2	10	1
##	KINGSBRIDGE/JEROME PARK	KIPS BAY	LITTLE ITALY
##	5	13	13
##	LITTLE NECK	LONG ISLAND CITY	LOWER EAST SIDE
##	1	24	42
##	MADISON	MANHATTAN VALLEY	MASPETH
##	19	23	4
##	MIDDLE VILLAGE	MIDTOWN CBD	MIDTOWN EAST
##	7	13	56
##	MIDTOWN WEST	MIDWOOD	MORNINGSIDE HEIGHTS
##	47	11	1
##	MORRIS PARK/VAN NEST	MORRISANIA/LONGWOOD	MOTT HAVEN/PORT MORRIS
##	1	16	1
##	MURRAY HILL	NEW BRIGHTON	NEW BRIGHTON-ST. GEORGE
##	39	3	2
##	NEW SPRINGVILLE	OAKLAND GARDENS	OCEAN HILL
##	9	1	10
##	OCEAN PARKWAY-NORTH	OCEAN PARKWAY-SOUTH	OZONE PARK
##	9	1	1
##	PARK SLOPE	PARK SLOPE SOUTH	PARKCHESTER
##	31	10	2
##	PELHAM PARKWAY SOUTH	PROSPECT HEIGHTS	REGO PARK
##	1	5	27
##	RIDGEWOOD	RIVERDALE	ROCKAWAY PARK
##	3	17	5
##	SCHUYLerville/PELHAM BAY	SHEEPSHEAD BAY	SILVER LAKE
##	1	27	2
##	SOHO	SOUNDVIEW	SOUTH OZONE PARK
##	55	6	1
##	SOUTHBRIDGE	SUNNYSIDE	SUNSET PARK
##	9	11	23
##	THROGS NECK	TOMPKINSVILLE	TRIBECA
##	3	1	74
##	UPPER EAST SIDE (59-79)	UPPER EAST SIDE (79-96)	UPPER EAST SIDE (96-110)
##	123	78	5
##	UPPER WEST SIDE (59-79)	UPPER WEST SIDE (79-96)	UPPER WEST SIDE (96-116)
##	87	66	34
##	WASHINGTON HEIGHTS LOWER	WASHINGTON HEIGHTS UPPER	WEST NEW BRIGHTON
##	5	6	1
##	WHITESTONE	WILLIAMSBRIDGE	WILLIAMSBURG-CENTRAL

##	2	2	60
##	WILLIAMSBURG-EAST	WILLIAMSBURG-NORTH	WILLIAMSBURG-SOUTH
##	38	26	34
##	WINDSOR TERRACE	WOODHAVEN	WOODSIDE
##	5	4	8
##	WYCKOFF HEIGHTS		
##	3		

```
table(neighbor, boro)
```

##	neighbor	boro	Bronx	Brooklyn	Manhattan	Queens	Staten	Island
##	ALPHABET CITY		0	0	24	0		0
##	ARROCHAR-SHORE ACRES		0	0	0	0		1
##	ASTORIA		0	0	0	30		0
##	BATH BEACH		0	6	0	0		0
##	BAY RIDGE		0	8	0	0		0
##	BAYSIDE		0	0	0	9		0
##	BEDFORD PARK/NORWOOD		2	0	0	0		0
##	BEDFORD STUYVESANT		0	58	0	0		0
##	BELMONT		1	0	0	0		0
##	BENSONHURST		0	7	0	0		0
##	BERGEN BEACH		0	1	0	0		0
##	BOERUM HILL		0	15	0	0		0
##	BOROUGH PARK		0	35	0	0		0
##	BRIARWOOD		0	0	0	4		0
##	BRIGHTON BEACH		0	21	0	0		0
##	BRONX-UNKNOWN		2	0	0	0		0
##	BRONXDALE		3	0	0	0		0
##	BROOKLYN HEIGHTS		0	9	0	0		0
##	BUSH TERMINAL		0	1	0	0		0
##	BUSHWICK		0	2	0	0		0
##	CANARSIE		0	4	0	0		0
##	CARROLL GARDENS		0	9	0	0		0
##	CHELSEA		0	0	88	0		0
##	CHINATOWN		0	0	21	0		0
##	CITY ISLAND		1	0	0	0		0
##	CIVIC CENTER		0	0	23	0		0
##	CLINTON		0	0	31	0		0
##	CLINTON HILL		0	13	0	0		0
##	COBBLE HILL		0	5	0	0		0
##	COBBLE HILL-WEST		0	8	0	0		0
##	COLLEGE POINT		0	0	0	3		0
##	CONEY ISLAND		0	4	0	0		0
##	CORONA		0	0	0	17		0
##	CROWN HEIGHTS		0	14	0	0		0
##	DOWNTOWN-FULTON FERRY		0	14	0	0		0
##	DOWNTOWN-FULTON MALL		0	2	0	0		0
##	DOWNTOWN-METROTECH		0	3	0	0		0
##	DYKER HEIGHTS		0	1	0	0		0
##	EAST NEW YORK		0	6	0	0		0
##	EAST TREMONT		3	0	0	0		0
##	EAST VILLAGE		0	0	26	0		0
##	ELMHURST		0	0	0	55		0

##	FAR ROCKAWAY	0	0	0	4	0
##	FASHION	0	0	15	0	0
##	FINANCIAL	0	0	36	0	0
##	FLATBUSH-CENTRAL	0	6	0	0	0
##	FLATBUSH-LEFFERTS GARDEN	0	1	0	0	0
##	FLATBUSH-NORTH	0	8	0	0	0
##	FLATIRON	0	0	45	0	0
##	FLUSHING-NORTH	0	0	0	133	0
##	FLUSHING-SOUTH	0	0	0	8	0
##	FLUSHING MEADOW PARK	0	0	0	1	0
##	FOREST HILLS	0	0	0	17	0
##	FORT GREENE	0	10	0	0	0
##	GLENDALE	0	0	0	3	0
##	GOWANUS	0	3	0	0	0
##	GRAMERCY	0	0	17	0	0
##	GRANT CITY	0	0	0	0	2
##	GRAVESEND	0	19	0	0	0
##	GREAT KILLS	0	0	0	0	1
##	GREENPOINT	0	19	0	0	0
##	GREENWICH VILLAGE-CENTRAL	0	0	60	0	0
##	GREENWICH VILLAGE-WEST	0	0	57	0	0
##	GRYMES HILL	0	0	0	0	1
##	HAMMELS	0	0	0	5	0
##	HARLEM-CENTRAL	0	0	94	0	0
##	HARLEM-EAST	0	0	36	0	0
##	HARLEM-UPPER	0	0	12	0	0
##	HARLEM-WEST	0	0	2	0	0
##	HIGHBRIDGE/MORRIS HEIGHTS	1	0	0	0	0
##	HILLCREST	0	0	0	1	0
##	HOLLIS	0	0	0	1	0
##	HOWARD BEACH	0	0	0	5	0
##	INWOOD	0	0	2	0	0
##	JACKSON HEIGHTS	0	0	0	21	0
##	JAMAICA	0	0	0	5	0
##	JAMAICA ESTATES	0	0	0	2	0
##	JAVITS CENTER	0	0	1	0	0
##	KENSINGTON	0	2	0	0	0
##	KEW GARDENS	0	0	0	10	0
##	KINGSBRIDGE HTS/UNIV HTS	1	0	0	0	0
##	KINGSBRIDGE/JEROME PARK	5	0	0	0	0
##	KIPS BAY	0	0	13	0	0
##	LITTLE ITALY	0	0	13	0	0
##	LITTLE NECK	0	0	0	1	0
##	LONG ISLAND CITY	0	0	0	24	0
##	LOWER EAST SIDE	0	0	42	0	0
##	MADISON	0	19	0	0	0
##	MANHATTAN VALLEY	0	0	23	0	0
##	MASPETH	0	0	0	4	0
##	MIDDLE VILLAGE	0	0	0	7	0
##	MIDTOWN CBD	0	0	13	0	0
##	MIDTOWN EAST	0	0	56	0	0
##	MIDTOWN WEST	0	0	47	0	0
##	MIDWOOD	0	11	0	0	0
##	MORNINGSIDE HEIGHTS	0	0	1	0	0

##	MORRIS PARK/VAN NEST	1	0	0	0	0
##	MORRISANIA/LONGWOOD	16	0	0	0	0
##	MOTT HAVEN/PORT MORRIS	1	0	0	0	0
##	MURRAY HILL	0	0	39	0	0
##	NEW BRIGHTON	0	0	0	0	3
##	NEW BRIGHTON-ST. GEORGE	0	0	0	0	2
##	NEW SPRINGVILLE	0	0	0	0	9
##	OAKLAND GARDENS	0	0	0	1	0
##	OCEAN HILL	0	10	0	0	0
##	OCEAN PARKWAY-NORTH	0	9	0	0	0
##	OCEAN PARKWAY-SOUTH	0	1	0	0	0
##	OZONE PARK	0	0	0	1	0
##	PARK SLOPE	0	31	0	0	0
##	PARK SLOPE SOUTH	0	10	0	0	0
##	PARKCHESTER	2	0	0	0	0
##	PELHAM PARKWAY SOUTH	1	0	0	0	0
##	PROSPECT HEIGHTS	0	5	0	0	0
##	REGO PARK	0	0	0	27	0
##	RIDGEWOOD	0	0	0	3	0
##	RIVERDALE	17	0	0	0	0
##	ROCKAWAY PARK	0	0	0	5	0
##	SCHUYLERVILLE/PELHAM BAY	1	0	0	0	0
##	SHEEPSHEAD BAY	0	27	0	0	0
##	SILVER LAKE	0	0	0	0	2
##	SOHO	0	0	55	0	0
##	SOUNDVIEW	6	0	0	0	0
##	SOUTH OZONE PARK	0	0	0	1	0
##	SOUTHBRIDGE	0	0	9	0	0
##	SUNNYSIDE	0	0	0	10	1
##	SUNSET PARK	0	23	0	0	0
##	THROGS NECK	3	0	0	0	0
##	TOMPKINSVILLE	0	0	0	0	1
##	TRIBECA	0	0	74	0	0
##	UPPER EAST SIDE (59-79)	0	0	123	0	0
##	UPPER EAST SIDE (79-96)	0	0	78	0	0
##	UPPER EAST SIDE (96-110)	0	0	5	0	0
##	UPPER WEST SIDE (59-79)	0	0	87	0	0
##	UPPER WEST SIDE (79-96)	0	0	66	0	0
##	UPPER WEST SIDE (96-116)	0	0	34	0	0
##	WASHINGTON HEIGHTS LOWER	0	0	5	0	0
##	WASHINGTON HEIGHTS UPPER	0	0	6	0	0
##	WEST NEW BRIGHTON	0	0	0	0	1
##	WHITESTONE	0	0	0	2	0
##	WILLIAMSBRIDGE	2	0	0	0	0
##	WILLIAMSBURG-CENTRAL	0	60	0	0	0
##	WILLIAMSBURG-EAST	0	38	0	0	0
##	WILLIAMSBURG-NORTH	0	26	0	0	0
##	WILLIAMSBURG-SOUTH	0	34	0	0	0
##	WINDSOR TERRACE	0	5	0	0	0
##	WOODHAVEN	0	0	0	4	0
##	WOODSIDE	0	0	0	8	0
##	WYCKOFF HEIGHTS	0	3	0	0	0

```
table(neighbor, cut(year, breaks = seq(min(year), max(year), by = 10)))
```

```
##
## neighbor          (1825,1835] (1835,1845] (1845,1855] (1855,1865]
## ALPHABET CITY      0            0            0            0
## ARROCHAR-SHORE ACRES 0            0            0            0
## ASTORIA            0            0            0            0
## BATH BEACH         0            0            0            0
## BAY RIDGE          0            0            0            0
## BAYSIDE            0            0            0            0
## BEDFORD PARK/NORWOOD 0            0            0            0
## BEDFORD STUYVESANT 0            0            0            0
## BELMONT            0            0            0            0
## BENSONHURST        0            0            0            0
## BERGEN BEACH       0            0            0            0
## BOERUM HILL        0            0            0            0
## BOROUGH PARK       0            0            0            0
## BRIARWOOD          0            0            0            0
## BRIGHTON BEACH     0            0            0            0
## BRONX-UNKNOWN      0            0            0            0
## BRONXDALE          0            0            0            0
## BROOKLYN HEIGHTS   0            0            0            0
## BUSH TERMINAL      0            0            0            0
## BUSHWICK           0            0            0            0
## CANARSIE           0            0            0            0
## CARROLL GARDENS    0            0            0            0
## CHELSEA            0            0            0            0
## CHINATOWN          0            0            0            0
## CITY ISLAND        0            0            0            0
## CIVIC CENTER       0            0            0            2
## CLINTON            0            0            0            0
## CLINTON HILL       0            0            0            0
## COBBLE HILL        0            0            0            0
## COBBLE HILL-WEST   0            0            0            0
## COLLEGE POINT      0            0            0            0
## CONEY ISLAND       0            0            0            0
## CORONA             0            0            0            0
## CROWN HEIGHTS      0            0            0            0
## DOWNTOWN-FULTON FERRY 0            0            0            0
## DOWNTOWN-FULTON MALL 0            0            0            0
## DOWNTOWN-METROTECH 0            0            0            0
## DYKER HEIGHTS      0            0            0            0
## EAST NEW YORK       0            0            0            0
## EAST TREMONT       0            0            0            0
## EAST VILLAGE       0            0            0            0
## ELMHURST           0            0            0            0
## FAR ROCKAWAY       0            0            0            0
## FASHION            0            0            0            0
## FINANCIAL          0            1            0            0
## FLATBUSH-CENTRAL    0            0            0            0
## FLATBUSH-LEFFERTS GARDEN 0            0            0            0
## FLATBUSH-NORTH     0            0            0            0
## FLATIRON           0            0            0            0
```

##	FLUSHING-NORTH	0	0	0	0
##	FLUSHING-SOUTH	0	0	0	0
##	FLUSHING MEADOW PARK	0	0	0	0
##	FOREST HILLS	0	0	0	0
##	FORT GREENE	0	0	0	0
##	GLENDALE	0	0	0	0
##	GOWANUS	0	0	0	0
##	GRAMERCY	0	0	0	0
##	GRANT CITY	0	0	0	0
##	GRAVESEND	0	0	0	0
##	GREAT KILLS	0	0	0	0
##	GREENPOINT	0	0	0	0
##	GREENWICH VILLAGE-CENTRAL	0	0	0	0
##	GREENWICH VILLAGE-WEST	0	0	0	0
##	GRYMES HILL	0	0	0	0
##	HAMMELS	0	0	0	0
##	HARLEM-CENTRAL	0	0	0	0
##	HARLEM-EAST	0	0	0	0
##	HARLEM-UPPER	0	0	0	0
##	HARLEM-WEST	0	0	0	0
##	HIGHBRIDGE/MORRIS HEIGHTS	0	0	0	0
##	HILLCREST	0	0	0	0
##	HOLLIS	0	0	0	0
##	HOWARD BEACH	0	0	0	0
##	INWOOD	0	0	0	0
##	JACKSON HEIGHTS	0	0	0	0
##	JAMAICA	0	0	0	0
##	JAMAICA ESTATES	0	0	0	0
##	JAVITS CENTER	0	0	0	0
##	KENSINGTON	0	0	0	0
##	KEW GARDENS	0	0	0	0
##	KINGSBRIDGE HTS/UNIV HTS	0	0	0	0
##	KINGSBRIDGE/JEROME PARK	0	0	0	0
##	KIPS BAY	0	0	0	0
##	LITTLE ITALY	0	0	0	0
##	LITTLE NECK	0	0	0	0
##	LONG ISLAND CITY	0	0	0	0
##	LOWER EAST SIDE	0	0	0	0
##	MADISON	0	0	0	0
##	MANHATTAN VALLEY	0	0	0	0
##	MASPETH	0	0	0	0
##	MIDDLE VILLAGE	0	0	0	0
##	MIDTOWN CBD	0	0	0	0
##	MIDTOWN EAST	0	0	0	0
##	MIDTOWN WEST	0	0	0	0
##	MIDWOOD	0	0	0	0
##	MORNINGSIDE HEIGHTS	0	0	0	0
##	MORRIS PARK/VAN NEST	0	0	0	0
##	MORRISANIA/LONGWOOD	0	0	0	0
##	MOTT HAVEN/PORT MORRIS	0	0	0	0
##	MURRAY HILL	0	0	0	0
##	NEW BRIGHTON	0	0	0	0
##	NEW BRIGHTON-ST. GEORGE	0	0	0	0
##	NEW SPRINGVILLE	0	0	0	0

##	OAKLAND GARDENS	0	0	0	0
##	OCEAN HILL	0	0	0	0
##	OCEAN PARKWAY-NORTH	0	0	0	0
##	OCEAN PARKWAY-SOUTH	0	0	0	0
##	OZONE PARK	0	0	0	0
##	PARK SLOPE	0	0	0	0
##	PARK SLOPE SOUTH	0	0	0	0
##	PARKCHESTER	0	0	0	0
##	PELHAM PARKWAY SOUTH	0	0	0	0
##	PROSPECT HEIGHTS	0	0	0	0
##	REGO PARK	0	0	0	0
##	RIDGEWOOD	0	0	0	0
##	RIVERDALE	0	0	0	0
##	ROCKAWAY PARK	0	0	0	0
##	SCHUYLerville/PELHAM BAY	0	0	0	0
##	SHEEPSHEAD BAY	0	0	0	0
##	SILVER LAKE	0	0	0	0
##	SOHO	0	0	0	0
##	SOUNDVIEW	0	0	0	0
##	SOUTH OZONE PARK	0	0	0	0
##	SOUTHBRIDGE	0	0	0	0
##	SUNNYSIDE	0	0	0	0
##	SUNSET PARK	0	0	0	0
##	THROGS NECK	0	0	0	0
##	TOMPKINSVILLE	0	0	0	0
##	TRIBECA	0	0	1	0
##	UPPER EAST SIDE (59-79)	0	0	0	0
##	UPPER EAST SIDE (79-96)	0	0	0	0
##	UPPER EAST SIDE (96-110)	0	0	0	0
##	UPPER WEST SIDE (59-79)	0	0	0	0
##	UPPER WEST SIDE (79-96)	0	0	0	0
##	UPPER WEST SIDE (96-116)	0	0	0	0
##	WASHINGTON HEIGHTS LOWER	0	0	0	0
##	WASHINGTON HEIGHTS UPPER	0	0	0	0
##	WEST NEW BRIGHTON	0	0	0	0
##	WHITESTONE	0	0	0	0
##	WILLIAMSBRIDGE	0	0	0	0
##	WILLIAMSBURG-CENTRAL	0	0	0	0
##	WILLIAMSBURG-EAST	0	0	0	0
##	WILLIAMSBURG-NORTH	0	0	0	0
##	WILLIAMSBURG-SOUTH	0	0	0	0
##	WINDSOR TERRACE	0	0	0	0
##	WOODHAVEN	0	0	0	0
##	WOODSIDE	0	0	0	0
##	WYCKOFF HEIGHTS	0	0	0	0
##					
##	neighbor	(1865,1875]	(1875,1885]	(1885,1895]	(1895,1905]
##	ALPHABET CITY	0	0	0	2
##	ARROCHAR-SHORE ACRES	0	0	0	0
##	ASTORIA	0	0	0	0
##	BATH BEACH	0	0	0	0
##	BAY RIDGE	0	0	0	0
##	BAYSIDE	0	0	0	0
##	BEDFORD PARK/NORWOOD	0	0	0	0

##	BEDFORD STUYVESANT	0	0	0	1
##	BELMONT	0	0	0	0
##	BENSONHURST	0	0	0	0
##	BERGEN BEACH	0	0	0	0
##	BOERUM HILL	0	0	0	1
##	BOROUGH PARK	0	0	0	0
##	BRIARWOOD	0	0	0	0
##	BRIGHTON BEACH	0	0	0	0
##	BRONX-UNKNOWN	0	0	0	0
##	BRONXDALE	0	0	0	0
##	BROOKLYN HEIGHTS	0	0	0	3
##	BUSH TERMINAL	0	0	0	0
##	BUSHWICK	0	0	0	0
##	CANARSIE	0	0	0	3
##	CARROLL GARDENS	0	0	1	2
##	CHELSEA	1	0	0	10
##	CHINATOWN	0	0	0	4
##	CITY ISLAND	0	0	0	1
##	CIVIC CENTER	0	0	1	4
##	CLINTON	0	0	0	1
##	CLINTON HILL	0	0	0	2
##	COBBLE HILL	0	0	0	2
##	COBBLE HILL-WEST	0	0	0	0
##	COLLEGE POINT	0	0	0	0
##	CONEY ISLAND	0	0	0	0
##	CORONA	0	0	0	0
##	CROWN HEIGHTS	0	0	0	0
##	DOWNTOWN-FULTON FERRY	0	0	0	2
##	DOWNTOWN-FULTON MALL	0	0	0	0
##	DOWNTOWN-METROTECH	0	0	0	0
##	DYKER HEIGHTS	0	0	0	0
##	EAST NEW YORK	0	0	0	0
##	EAST TREMONT	0	0	0	0
##	EAST VILLAGE	0	0	0	6
##	ELMHURST	0	0	0	0
##	FAR ROCKAWAY	0	0	0	0
##	FASHION	0	0	0	0
##	FINANCIAL	0	0	1	6
##	FLATBUSH-CENTRAL	0	0	0	0
##	FLATBUSH-LEFFERTS GARDEN	0	0	0	0
##	FLATBUSH-NORTH	0	0	0	0
##	FLATIRON	0	1	0	7
##	FLUSHING-NORTH	0	0	0	0
##	FLUSHING-SOUTH	0	0	0	0
##	FLUSHING MEADOW PARK	0	0	0	0
##	FOREST HILLS	0	0	0	0
##	FORT GREENE	0	0	0	1
##	GLENDALE	0	0	0	1
##	GOWANUS	0	0	0	0
##	GRAMERCY	0	0	0	1
##	GRANT CITY	0	0	0	0
##	GRAVESEND	0	0	0	0
##	GREAT KILLS	0	0	0	0
##	GREENPOINT	0	0	1	1

##	GREENWICH VILLAGE-CENTRAL	0	0	1	12
##	GREENWICH VILLAGE-WEST	0	0	1	6
##	GRYMES HILL	0	0	0	0
##	HAMMELS	0	0	0	0
##	HARLEM-CENTRAL	0	1	2	16
##	HARLEM-EAST	0	0	0	3
##	HARLEM-UPPER	0	0	0	0
##	HARLEM-WEST	0	0	0	0
##	HIGHBRIDGE/MORRIS HEIGHTS	0	0	0	0
##	HILLCREST	0	0	0	0
##	HOLLIS	0	0	0	0
##	HOWARD BEACH	0	0	0	0
##	INWOOD	0	0	0	0
##	JACKSON HEIGHTS	0	0	0	0
##	JAMAICA	0	0	0	0
##	JAMAICA ESTATES	0	0	0	0
##	JAVITS CENTER	0	0	0	0
##	KENSINGTON	0	0	0	0
##	KEW GARDENS	0	0	0	0
##	KINGSBRIDGE HTS/UNIV HTS	0	0	0	0
##	KINGSBRIDGE/JEROME PARK	0	0	0	0
##	KIPS BAY	0	0	0	2
##	LITTLE ITALY	0	0	0	6
##	LITTLE NECK	0	0	0	0
##	LONG ISLAND CITY	0	0	0	0
##	LOWER EAST SIDE	0	0	0	10
##	MADISON	0	0	0	0
##	MANHATTAN VALLEY	0	0	0	4
##	MASPETH	0	0	0	0
##	MIDDLE VILLAGE	0	0	0	0
##	MIDTOWN CBD	0	0	0	0
##	MIDTOWN EAST	0	0	0	4
##	MIDTOWN WEST	0	0	0	1
##	MIDWOOD	0	0	0	0
##	MORNINGSIDE HEIGHTS	0	0	0	0
##	MORRIS PARK/VAN NEST	0	0	0	0
##	MORRISANIA/LONGWOOD	0	0	0	1
##	MOTT HAVEN/PORT MORRIS	0	0	0	1
##	MURRAY HILL	0	0	0	0
##	NEW BRIGHTON	0	0	0	0
##	NEW BRIGHTON-ST. GEORGE	0	0	0	0
##	NEW SPRINGVILLE	0	0	0	0
##	OAKLAND GARDENS	0	0	0	0
##	OCEAN HILL	0	0	0	1
##	OCEAN PARKWAY-NORTH	0	0	0	0
##	OCEAN PARKWAY-SOUTH	0	0	0	0
##	OZONE PARK	0	0	0	0
##	PARK SLOPE	0	0	0	1
##	PARK SLOPE SOUTH	0	0	0	0
##	PARKCHESTER	0	0	0	0
##	PELHAM PARKWAY SOUTH	0	0	0	0
##	PROSPECT HEIGHTS	0	0	0	0
##	REGO PARK	0	0	0	0
##	RIDGEWOOD	0	0	0	0

##	RIVERDALE	0	0	0	0
##	ROCKAWAY PARK	0	0	0	0
##	SCHUYLERVILLE/PELHAM BAY	0	0	0	0
##	SHEEPSHEAD BAY	0	0	0	0
##	SILVER LAKE	0	0	0	0
##	SOHO	1	3	3	15
##	SOUNDVIEW	0	0	0	0
##	SOUTH OZONE PARK	0	0	0	0
##	SOUTHBRIDGE	0	0	0	4
##	SUNNYSIDE	0	0	0	0
##	SUNSET PARK	0	0	0	1
##	THROGS NECK	0	0	0	0
##	TOMPKINSVILLE	0	0	0	0
##	TRIBECA	1	0	1	2
##	UPPER EAST SIDE (59-79)	0	0	0	4
##	UPPER EAST SIDE (79-96)	0	0	0	1
##	UPPER EAST SIDE (96-110)	0	0	0	0
##	UPPER WEST SIDE (59-79)	0	0	0	8
##	UPPER WEST SIDE (79-96)	0	0	0	6
##	UPPER WEST SIDE (96-116)	0	0	0	2
##	WASHINGTON HEIGHTS LOWER	0	0	0	1
##	WASHINGTON HEIGHTS UPPER	0	0	0	0
##	WEST NEW BRIGHTON	0	0	0	0
##	WHITESTONE	0	0	0	0
##	WILLIAMSBRIDGE	0	0	0	0
##	WILLIAMSBURG-CENTRAL	0	0	0	1
##	WILLIAMSBURG-EAST	0	0	0	1
##	WILLIAMSBURG-NORTH	0	0	0	1
##	WILLIAMSBURG-SOUTH	0	0	0	2
##	WINDSOR TERRACE	0	0	0	0
##	WOODHAVEN	0	0	0	0
##	WOODSIDE	0	0	0	0
##	WYCKOFF HEIGHTS	0	0	0	0
##					
##	neighbor	(1905,1915]	(1915,1925]	(1925,1935]	(1935,1945]
##	ALPHABET CITY	0	6	1	0
##	ARROCHAR-SHORE ACRES	0	0	0	0
##	ASTORIA	1	0	2	1
##	BATH BEACH	0	1	0	0
##	BAY RIDGE	0	0	0	0
##	BAYSIDE	0	0	0	0
##	BEDFORD PARK/NORWOOD	0	0	0	0
##	BEDFORD STUYVESANT	2	1	0	0
##	BELMONT	0	0	0	0
##	BENSONHURST	0	1	0	1
##	BERGEN BEACH	0	0	0	0
##	BOERUM HILL	4	2	0	0
##	BOROUGH PARK	0	2	7	0
##	BRIARWOOD	0	0	0	0
##	BRIGHTON BEACH	0	0	1	1
##	BRONX-UNKNOWN	0	0	2	0
##	BRONXDALE	0	0	0	0
##	BROOKLYN HEIGHTS	2	2	0	0
##	BUSH TERMINAL	0	0	0	0

##	BUSHWICK	0	0	0	0
##	CANARSIE	0	0	0	0
##	CARROLL GARDENS	0	0	0	0
##	CHELSEA	18	5	8	1
##	CHINATOWN	6	0	1	0
##	CITY ISLAND	0	0	0	0
##	CIVIC CENTER	9	4	1	0
##	CLINTON	3	2	1	0
##	CLINTON HILL	1	1	3	0
##	COBBLE HILL	0	1	0	0
##	COBBLE HILL-WEST	0	2	1	0
##	COLLEGE POINT	0	0	0	0
##	CONEY ISLAND	0	0	0	0
##	CORONA	0	0	0	0
##	CROWN HEIGHTS	1	3	2	0
##	DOWNTOWN-FULTON FERRY	3	2	0	0
##	DOWNTOWN-FULTON MALL	0	0	1	0
##	DOWNTOWN-METROTECH	0	0	1	0
##	DYKER HEIGHTS	0	0	0	0
##	EAST NEW YORK	0	0	0	0
##	EAST TREMONT	0	0	0	0
##	EAST VILLAGE	2	5	0	0
##	ELMHURST	0	0	1	3
##	FAR ROCKAWAY	0	0	0	0
##	FASHION	0	2	3	0
##	FINANCIAL	5	4	7	0
##	FLATBUSH-CENTRAL	1	0	2	0
##	FLATBUSH-LEFFERTS GARDEN	0	1	0	0
##	FLATBUSH-NORTH	0	1	0	0
##	FLATIRON	25	1	0	0
##	FLUSHING-NORTH	0	0	4	2
##	FLUSHING-SOUTH	0	0	0	0
##	FLUSHING MEADOW PARK	0	0	0	0
##	FOREST HILLS	0	0	1	4
##	FORT GREENE	0	1	3	0
##	GLENDALE	0	0	0	0
##	GOWANUS	0	0	0	1
##	GRAMERCY	3	4	2	0
##	GRANT CITY	0	0	0	0
##	GRAVESEND	0	0	0	0
##	GREAT KILLS	0	0	0	0
##	GREENPOINT	1	0	0	0
##	GREENWICH VILLAGE-CENTRAL	15	3	8	0
##	GREENWICH VILLAGE-WEST	13	6	7	1
##	GRYMES HILL	0	0	0	0
##	HAMMELS	0	0	0	0
##	HARLEM-CENTRAL	14	4	3	0
##	HARLEM-EAST	3	2	2	0
##	HARLEM-UPPER	4	4	2	0
##	HARLEM-WEST	0	0	0	0
##	HIGHBRIDGE/MORRIS HEIGHTS	0	0	0	0
##	HILLCREST	0	0	0	0
##	HOLLIS	0	0	0	0
##	HOWARD BEACH	0	0	0	0

##	INWOOD	0	1	0	0
##	JACKSON HEIGHTS	0	0	12	5
##	JAMAICA	0	0	0	0
##	JAMAICA ESTATES	0	0	0	0
##	JAVITS CENTER	1	0	0	0
##	KENSINGTON	0	0	0	0
##	KEW GARDENS	0	1	1	0
##	KINGSBRIDGE HTS/UNIV HTS	0	0	0	0
##	KINGSBRIDGE/JEROME PARK	0	0	0	0
##	KIPS BAY	2	0	0	0
##	LITTLE ITALY	1	0	1	0
##	LITTLE NECK	0	0	0	1
##	LONG ISLAND CITY	1	1	1	0
##	LOWER EAST SIDE	4	3	4	2
##	MADISON	0	0	0	0
##	MANHATTAN VALLEY	1	0	2	2
##	MASPETH	0	0	0	0
##	MIDDLE VILLAGE	0	0	0	0
##	MIDTOWN CBD	0	0	1	0
##	MIDTOWN EAST	0	1	3	1
##	MIDTOWN WEST	2	6	7	2
##	MIDWOOD	0	1	0	0
##	MORNINGSIDE HEIGHTS	0	0	1	0
##	MORRIS PARK/VAN NEST	0	0	0	0
##	MORRISANIA/LONGWOOD	1	0	1	0
##	MOTT HAVEN/PORT MORRIS	0	0	0	0
##	MURRAY HILL	2	8	0	1
##	NEW BRIGHTON	0	0	0	0
##	NEW BRIGHTON-ST. GEORGE	0	0	0	0
##	NEW SPRINGVILLE	0	0	0	0
##	OAKLAND GARDENS	0	0	0	0
##	OCEAN HILL	6	0	0	0
##	OCEAN PARKWAY-NORTH	0	0	2	1
##	OCEAN PARKWAY-SOUTH	0	0	0	0
##	OZONE PARK	0	0	0	0
##	PARK SLOPE	4	7	3	0
##	PARK SLOPE SOUTH	0	1	2	0
##	PARKCHESTER	0	0	2	0
##	PELHAM PARKWAY SOUTH	0	0	0	0
##	PROSPECT HEIGHTS	1	0	1	0
##	REGO PARK	0	0	0	5
##	RIDGEWOOD	0	0	0	0
##	RIVERDALE	0	0	1	2
##	ROCKAWAY PARK	0	0	0	0
##	SCHUYLerville/PELHAM BAY	0	0	0	0
##	SHEEPSHEAD BAY	0	0	0	0
##	SILVER LAKE	0	0	1	1
##	SOHO	5	9	1	1
##	SOUNDVIEW	0	0	0	0
##	SOUTH OZONE PARK	0	0	1	0
##	SOUTHBRIDGE	1	1	0	1
##	SUNNYSIDE	0	0	1	5
##	SUNSET PARK	0	0	2	0
##	THROGS NECK	0	0	0	0

##	TOMPKINSVILLE	0	0	0	0
##	TRIBECA	22	9	6	1
##	UPPER EAST SIDE (59-79)	15	6	13	5
##	UPPER EAST SIDE (79-96)	6	7	10	2
##	UPPER EAST SIDE (96-110)	0	2	1	0
##	UPPER WEST SIDE (59-79)	5	6	10	2
##	UPPER WEST SIDE (79-96)	13	17	7	0
##	UPPER WEST SIDE (96-116)	6	10	5	1
##	WASHINGTON HEIGHTS LOWER	0	2	1	0
##	WASHINGTON HEIGHTS UPPER	0	0	1	1
##	WEST NEW BRIGHTON	0	0	0	0
##	WHITESTONE	0	0	0	0
##	WILLIAMSBRIDGE	0	0	0	0
##	WILLIAMSBURG-CENTRAL	1	1	1	0
##	WILLIAMSBURG-EAST	0	1	0	0
##	WILLIAMSBURG-NORTH	4	1	0	0
##	WILLIAMSBURG-SOUTH	2	3	0	0
##	WINDSOR TERRACE	0	0	0	0
##	WOODHAVEN	0	0	0	0
##	WOODSIDE	0	0	0	0
##	WYCKOFF HEIGHTS	0	0	0	0
##					
##	neighbor	(1945,1955]	(1955,1965]	(1965,1975]	(1975,1985]
##	ALPHABET CITY	0	1	0	0
##	ARROCHAR-SHORE ACRES	0	0	0	0
##	ASTORIA	1	2	0	0
##	BATH BEACH	0	0	0	1
##	BAY RIDGE	0	0	0	2
##	BAYSIDE	2	0	0	5
##	BEDFORD PARK/NORWOOD	0	0	1	0
##	BEDFORD STUYVESANT	0	0	0	0
##	BELMONT	0	0	0	0
##	BENSONHURST	0	0	0	0
##	BERGEN BEACH	0	0	0	0
##	BOERUM HILL	0	0	0	0
##	BOROUGH PARK	0	0	0	4
##	BRIARWOOD	0	0	1	0
##	BRIGHTON BEACH	0	1	0	0
##	BRONX-UNKNOWN	0	0	0	0
##	BRONXDALE	0	2	0	0
##	BROOKLYN HEIGHTS	0	0	0	0
##	BUSH TERMINAL	0	0	0	0
##	BUSHWICK	0	0	0	0
##	CANARSIE	0	0	0	1
##	CARROLL GARDENS	0	0	0	0
##	CHELSEA	2	2	2	4
##	CHINATOWN	0	0	0	1
##	CITY ISLAND	0	0	0	0
##	CIVIC CENTER	0	0	1	0
##	CLINTON	0	0	0	0
##	CLINTON HILL	0	1	0	0
##	COBBLE HILL	0	0	0	0
##	COBBLE HILL-WEST	0	0	0	0
##	COLLEGE POINT	0	0	0	1

##	CONEY ISLAND	0	1	0	0
##	CORONA	0	0	0	0
##	CROWN HEIGHTS	0	0	0	0
##	DOWNTOWN-FULTON FERRY	0	0	0	0
##	DOWNTOWN-FULTON MALL	0	0	0	0
##	DOWNTOWN-METROTECH	0	0	0	0
##	DYKER HEIGHTS	0	0	0	0
##	EAST NEW YORK	0	0	0	0
##	EAST TREMONT	0	0	0	0
##	EAST VILLAGE	0	1	0	1
##	ELMHURST	1	8	0	2
##	FAR ROCKAWAY	0	1	0	0
##	FASHION	0	0	0	1
##	FINANCIAL	0	2	1	3
##	FLATBUSH-CENTRAL	0	0	0	0
##	FLATBUSH-LEFFERTS GARDEN	0	0	0	0
##	FLATBUSH-NORTH	0	0	0	0
##	FLATIRON	0	2	0	1
##	FLUSHING-NORTH	1	7	5	15
##	FLUSHING-SOUTH	1	1	0	0
##	FLUSHING MEADOW PARK	0	0	0	0
##	FOREST HILLS	2	2	2	0
##	FORT GREENE	0	0	0	0
##	GLENDALE	0	0	0	0
##	GOWANUS	0	0	0	0
##	GRAMERCY	2	2	0	0
##	GRANT CITY	0	1	0	0
##	GRAVESEND	0	1	0	0
##	GREAT KILLS	0	1	0	0
##	GREENPOINT	0	0	0	0
##	GREENWICH VILLAGE-CENTRAL	4	4	2	2
##	GREENWICH VILLAGE-WEST	0	3	0	1
##	GRYMES HILL	0	0	0	0
##	HAMMELS	0	0	0	0
##	HARLEM-CENTRAL	0	0	0	0
##	HARLEM-EAST	0	0	0	0
##	HARLEM-UPPER	0	0	0	0
##	HARLEM-WEST	0	0	0	0
##	HIGHBRIDGE/MORRIS HEIGHTS	0	0	0	0
##	HILLCREST	0	0	1	0
##	HOLLIS	0	0	0	0
##	HOWARD BEACH	0	2	2	1
##	INWOOD	0	0	0	0
##	JACKSON HEIGHTS	2	1	0	0
##	JAMAICA	0	0	0	0
##	JAMAICA ESTATES	0	0	0	0
##	JAVITS CENTER	0	0	0	0
##	KENSINGTON	0	0	0	0
##	KEW GARDENS	1	2	0	1
##	KINGSBRIDGE HTS/UNIV HTS	0	0	0	0
##	KINGSBRIDGE/JEROME PARK	0	0	0	0
##	KIPS BAY	0	3	1	2
##	LITTLE ITALY	1	0	0	0
##	LITTLE NECK	0	0	0	0

##	LONG ISLAND CITY	1	0	0	0
##	LOWER EAST SIDE	1	0	0	0
##	MADISON	0	0	0	0
##	MANHATTAN VALLEY	0	4	0	0
##	MASPETH	0	0	0	0
##	MIDDLE VILLAGE	0	0	0	2
##	MIDTOWN CBD	1	3	2	3
##	MIDTOWN EAST	0	14	2	15
##	MIDTOWN WEST	4	1	2	4
##	MIDWOOD	0	0	0	0
##	MORNINGSIDE HEIGHTS	0	0	0	0
##	MORRIS PARK/VAN NEST	0	0	0	0
##	MORRISANIA/LONGWOOD	0	0	0	0
##	MOTT HAVEN/PORT MORRIS	0	0	0	0
##	MURRAY HILL	1	7	0	3
##	NEW BRIGHTON	0	0	0	0
##	NEW BRIGHTON-ST. GEORGE	0	0	0	0
##	NEW SPRINGVILLE	0	0	0	1
##	OAKLAND GARDENS	0	1	0	0
##	OCEAN HILL	0	0	0	0
##	OCEAN PARKWAY-NORTH	0	0	0	0
##	OCEAN PARKWAY-SOUTH	0	0	0	0
##	OZONE PARK	0	0	0	0
##	PARK SLOPE	0	0	0	0
##	PARK SLOPE SOUTH	0	0	0	0
##	PARKCHESTER	0	0	0	0
##	PELHAM PARKWAY SOUTH	0	1	0	0
##	PROSPECT HEIGHTS	0	0	0	0
##	REGO PARK	5	5	3	1
##	RIDGEWOOD	0	0	0	0
##	RIVERDALE	1	2	0	1
##	ROCKAWAY PARK	0	0	0	0
##	SCHUYLerville/PELHAM BAY	0	0	0	0
##	SHEEPSHEAD BAY	0	4	0	0
##	SILVER LAKE	0	0	0	0
##	SOHO	1	0	0	0
##	SOUNDVIEW	0	0	0	0
##	SOUTH OZONE PARK	0	0	0	0
##	SOUTHBRIDGE	0	0	0	1
##	SUNNYSIDE	0	0	0	1
##	SUNSET PARK	0	0	0	0
##	THROGS NECK	0	0	0	0
##	TOMPKINSVILLE	0	1	0	0
##	TRIBECA	0	1	0	7
##	UPPER EAST SIDE (59-79)	4	24	1	10
##	UPPER EAST SIDE (79-96)	0	4	6	12
##	UPPER EAST SIDE (96-110)	0	0	0	0
##	UPPER WEST SIDE (59-79)	1	10	2	7
##	UPPER WEST SIDE (79-96)	2	1	1	3
##	UPPER WEST SIDE (96-116)	0	0	0	1
##	WASHINGTON HEIGHTS LOWER	0	0	0	0
##	WASHINGTON HEIGHTS UPPER	1	0	1	0
##	WEST NEW BRIGHTON	0	0	0	0
##	WHITESTONE	1	0	0	0

##	WILLIAMSBRIDGE	0	0	0	0
##	WILLIAMSBURG-CENTRAL	0	0	0	0
##	WILLIAMSBURG-EAST	0	0	0	0
##	WILLIAMSBURG-NORTH	0	0	0	0
##	WILLIAMSBURG-SOUTH	0	0	0	0
##	WINDSOR TERRACE	0	0	0	0
##	WOODHAVEN	0	4	0	0
##	WOODSIDE	0	0	0	0
##	WYCKOFF HEIGHTS	0	0	0	0
##					
##	neighbor	(1985,1995]	(1995,2005]		
##	ALPHABET CITY	1	11		
##	ARROCHAR-SHORE ACRES	1	0		
##	ASTORIA	3	3		
##	BATH BEACH	0	1		
##	BAY RIDGE	2	3		
##	BAYSIDE	1	0		
##	BEDFORD PARK/NORWOOD	1	0		
##	BEDFORD STUYVESANT	0	38		
##	BELMONT	0	0		
##	BENSONHURST	0	4		
##	BERGEN BEACH	0	1		
##	BOERUM HILL	1	4		
##	BOROUGH PARK	1	13		
##	BRIARWOOD	1	0		
##	BRIGHTON BEACH	2	12		
##	BRONX-UNKNOWN	0	0		
##	BRONXDALE	0	0		
##	BROOKLYN HEIGHTS	0	1		
##	BUSH TERMINAL	0	0		
##	BUSHWICK	0	0		
##	CANARSIE	0	0		
##	CARROLL GARDENS	0	4		
##	CHELSEA	3	15		
##	CHINATOWN	5	2		
##	CITY ISLAND	0	0		
##	CIVIC CENTER	0	0		
##	CLINTON	5	12		
##	CLINTON HILL	1	1		
##	COBBLE HILL	0	1		
##	COBBLE HILL-WEST	1	2		
##	COLLEGE POINT	1	1		
##	CONEY ISLAND	1	0		
##	CORONA	4	6		
##	CROWN HEIGHTS	1	3		
##	DOWNTOWN-FULTON FERRY	0	1		
##	DOWNTOWN-FULTON MALL	0	1		
##	DOWNTOWN-METROTECH	0	1		
##	DYKER HEIGHTS	1	0		
##	EAST NEW YORK	5	0		
##	EAST TREMONT	0	0		
##	EAST VILLAGE	2	3		
##	ELMHURST	20	9		
##	FAR ROCKAWAY	0	0		

##	FASHION	1	6
##	FINANCIAL	2	3
##	FLATBUSH-CENTRAL	0	0
##	FLATBUSH-LEFFERTS GARDEN	0	0
##	FLATBUSH-NORTH	2	3
##	FLATIRON	4	0
##	FLUSHING-NORTH	35	33
##	FLUSHING-SOUTH	1	0
##	FLUSHING MEADOW PARK	1	0
##	FOREST HILLS	3	1
##	FORT GREENE	2	1
##	GLENDALE	2	0
##	GOWANUS	0	1
##	GRAMERCY	1	1
##	GRANT CITY	1	0
##	GRAVESEND	1	13
##	GREAT KILLS	0	0
##	GREENPOINT	0	10
##	GREENWICH VILLAGE-CENTRAL	3	2
##	GREENWICH VILLAGE-WEST	9	7
##	GRYMES HILL	1	0
##	HAMMELS	0	3
##	HARLEM-CENTRAL	4	24
##	HARLEM-EAST	1	8
##	HARLEM-UPPER	0	2
##	HARLEM-WEST	0	1
##	HIGHBRIDGE/MORRIS HEIGHTS	0	1
##	HILLCREST	0	0
##	HOLLIS	0	1
##	HOWARD BEACH	0	0
##	INWOOD	0	0
##	JACKSON HEIGHTS	0	0
##	JAMAICA	0	0
##	JAMAICA ESTATES	1	0
##	JAVITS CENTER	0	0
##	KENSINGTON	0	1
##	KEW GARDENS	0	4
##	KINGSBRIDGE HTS/UNIV HTS	0	0
##	KINGSBRIDGE/JEROME PARK	0	2
##	KIPS BAY	2	0
##	LITTLE ITALY	3	0
##	LITTLE NECK	0	0
##	LONG ISLAND CITY	0	3
##	LOWER EAST SIDE	6	12
##	MADISON	1	13
##	MANHATTAN VALLEY	3	3
##	MASPETH	4	0
##	MIDDLE VILLAGE	3	0
##	MIDTOWN CBD	0	2
##	MIDTOWN EAST	4	9
##	MIDTOWN WEST	6	8
##	MIDWOOD	0	7
##	MORNINGSIDE HEIGHTS	0	0
##	MORRIS PARK/VAN NEST	0	1

##	MORRISANIA/LONGWOOD	0	6
##	MOTT HAVEN/PORT MORRIS	0	0
##	MURRAY HILL	6	7
##	NEW BRIGHTON	3	0
##	NEW BRIGHTON-ST. GEORGE	1	1
##	NEW SPRINGVILLE	8	0
##	OAKLAND GARDENS	0	0
##	OCEAN HILL	3	0
##	OCEAN PARKWAY-NORTH	0	2
##	OCEAN PARKWAY-SOUTH	0	0
##	OZONE PARK	1	0
##	PARK SLOPE	2	11
##	PARK SLOPE SOUTH	1	3
##	PARKCHESTER	0	0
##	PELHAM PARKWAY SOUTH	0	0
##	PROSPECT HEIGHTS	0	3
##	REGO PARK	4	2
##	RIDGEWOOD	2	1
##	RIVERDALE	3	6
##	ROCKAWAY PARK	1	2
##	SCHUYLerville/PELHAM BAY	0	1
##	SHEEPSHEAD BAY	2	14
##	SILVER LAKE	0	0
##	SOHO	1	10
##	SOUNDVIEW	6	0
##	SOUTH OZONE PARK	0	0
##	SOUTHBRIDGE	0	1
##	SUNNYSIDE	1	1
##	SUNSET PARK	2	6
##	THROGS NECK	0	3
##	TOMPKINSVILLE	0	0
##	TRIBECA	11	7
##	UPPER EAST SIDE (59-79)	16	17
##	UPPER EAST SIDE (79-96)	18	7
##	UPPER EAST SIDE (96-110)	0	2
##	UPPER WEST SIDE (59-79)	16	10
##	UPPER WEST SIDE (79-96)	13	2
##	UPPER WEST SIDE (96-116)	3	3
##	WASHINGTON HEIGHTS LOWER	0	0
##	WASHINGTON HEIGHTS UPPER	0	2
##	WEST NEW BRIGHTON	1	0
##	WHITESTONE	0	0
##	WILLIAMSBRIDGE	0	1
##	WILLIAMSBURG-CENTRAL	1	45
##	WILLIAMSBURG-EAST	0	22
##	WILLIAMSBURG-NORTH	0	2
##	WILLIAMSBURG-SOUTH	1	21
##	WINDSOR TERRACE	1	1
##	WOODHAVEN	0	0
##	WOODSIDE	3	3
##	WYCKOFF HEIGHTS	0	0

- b. Create multiple plots to demonstrates the correlations between different variables. Remember to label all axes and give title to each graph.

```
# Enter your code here!
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.2.3
```

```
##
```

```
## Attaching package: 'ggplot2'
```

```
## The following object is masked _by_ '.GlobalEnv':
```

```
##
```

```
##      mpg
```

```
library(dplyr)
```

```
##
```

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

```
## The following objects are masked from 'package:stats':
```

```
##
```

```
##      filter, lag
```

```
## The following objects are masked from 'package:base':
```

```
##
```

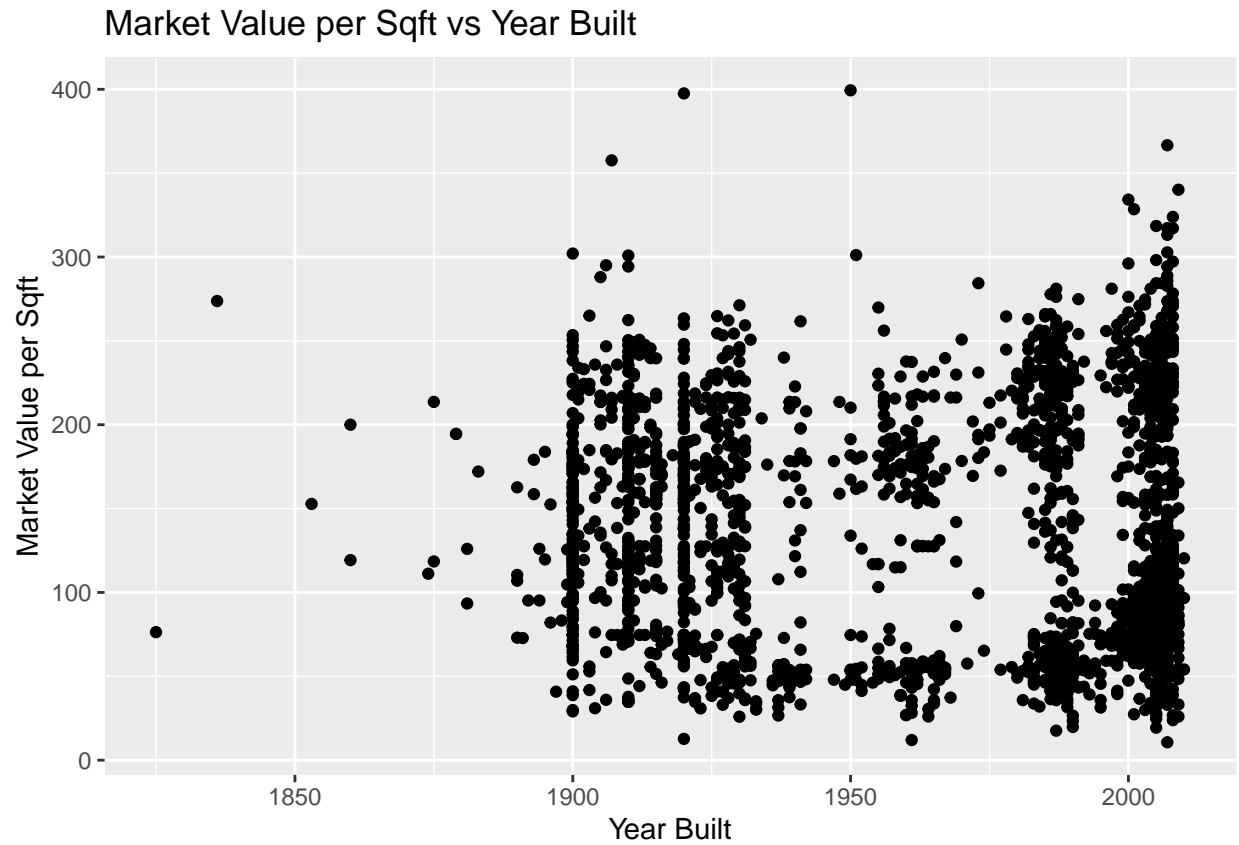
```
##      intersect, setdiff, setequal, union
```

```
# variable
```

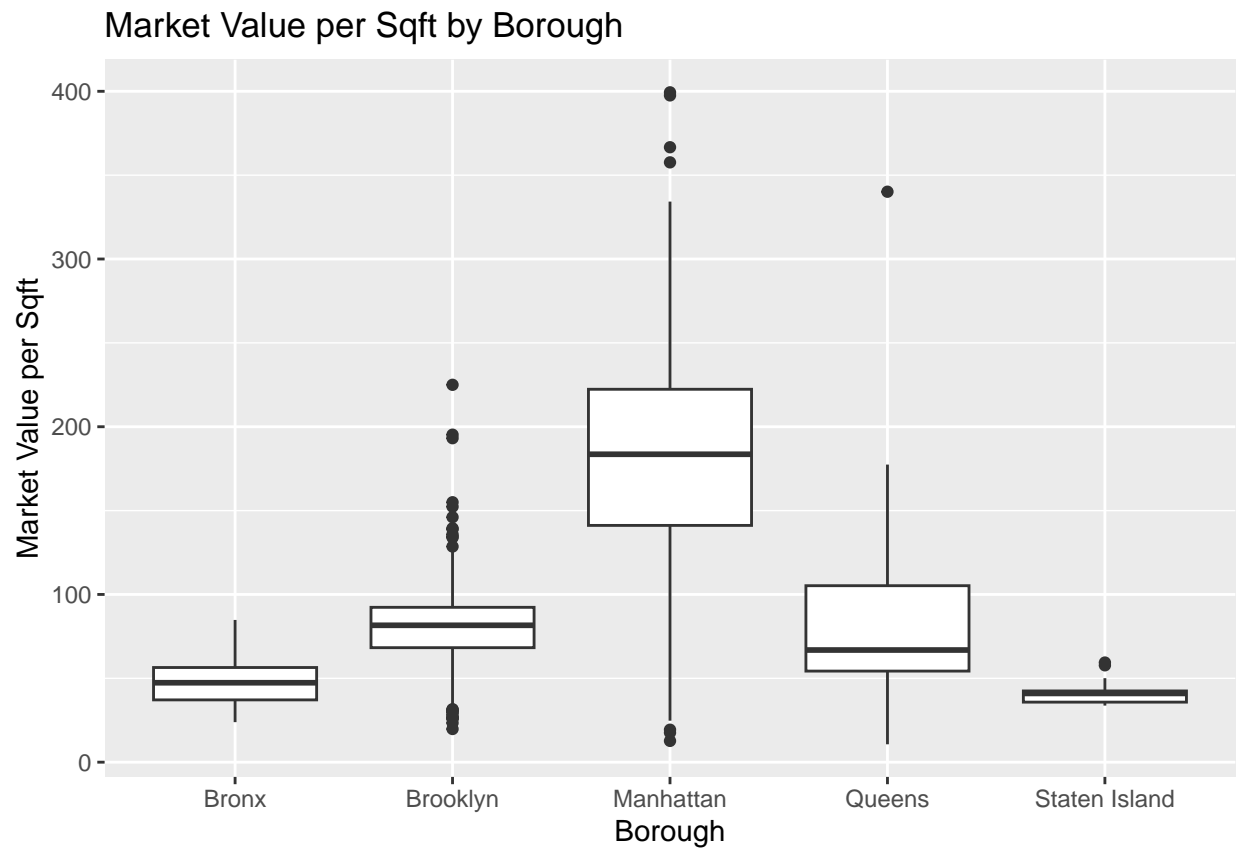
```
avgMarket <- tapply(market, boro, mean)
```

```
# plot
```

```
ggplot(data = housingData, aes(x = year, y = market)) +  
  geom_point() +  
  labs(title = "Market Value per Sqft vs Year Built",  
        x = "Year Built",  
        y = "Market Value per Sqft")
```



```
ggplot(data = housingData, aes(x = boro, y = market)) +  
  geom_boxplot() +  
  labs(title = "Market Value per Sqft by Borough",  
        x = "Borough",  
        y = "Market Value per Sqft")
```



```
barplot(avgMarket,  
  main = "Average Market Value per Sqft by Borough",  
  xlab = "Borough",  
  ylab = "Average Market Value per Sqft")
```

Average Market Value per Sqft by Borough



c. Write a summary about your findings from this exercise.

=> Enter your answer here!

The bar plot and histogram appear quite similar. In both, Manhattan is a popular borough that has the highest market value per square feet, completely dwarfing all the other boroughs. Also, Staten Island has the lowest market value per square feet, barely appearing in the histogram. In the scatter plot shows that most of the market value per square feet is between 50 and 250, especially more densely for those built between 1975 and 2000s. Those built in the 2000s do seem to have a higher reach in the market value compared to older homes, but of course there will be outliers. From 1825 to 1900, there aren't many housings being put up on market, and seem to keep between 100 and 200 market value per square feet.