Case Study 2

```
dat <- read.csv("AB_NYC_2019.csv", header = TRUE)

# Split numbers and strings:
col_str <- c("name", "host_name", "neighbourhood_group", "neighbourhood", "room_type",
             "last_review")
col_num <- names(dat)[!names(dat) %in% col_str]

# Find column with missing values
colnames(dat)[colSums(is.na(dat)) > 0] # reviews_per_month has NAs
```

```
## [1] "reviews_per_month"
```

```
summary(dat$number_of_reviews[which(is.na(dat$reviews_per_month))])
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##       0       0       0       0       0       0
```

```
sum(dat$last_review[which(is.na(dat$reviews_per_month))]!="")
```

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

```
# all missing values in reviews_per_month correspond to 0 in number_of_reviews and blank in last_review
# fill in "reviews_per_month" with 0
dat$reviews_per_month[which(is.na(dat$reviews_per_month))] <- 0

# str(dat)

# Drop useless columns
drops <- c("id", "host_name", "host_id")
dat <- dat[ , !(names(dat) %in% drops)]

# Check unique values
unique(dat$neighbourhood_group)
```

```
## [1] Brooklyn      Manhattan     Queens        Staten Island Bronx
## Levels: Bronx Brooklyn Manhattan Queens Staten Island
```

```
unique(dat$neighbourhood)
```

```
##   [1] Kensington                Midtown
##   [3] Harlem                    Clinton Hill
##   [5] East Harlem               Murray Hill
```

```
##   [7] Bedford-Stuyvesant         Hell's Kitchen
##   [9] Upper West Side            Chinatown
##  [11] South Slope                West Village
##  [13] Williamsburg               Fort Greene
##  [15] Chelsea                    Crown Heights
##  [17] Park Slope                 Windsor Terrace
##  [19] Inwood                     East Village
##  [21] Greenpoint                 Bushwick
##  [23] Flatbush                   Lower East Side
##  [25] Prospect-Lefferts Gardens  Long Island City
##  [27] Kips Bay                   SoHo
##  [29] Upper East Side            Prospect Heights
##  [31] Washington Heights         Woodside
##  [33] Brooklyn Heights           Carroll Gardens
##  [35] Gowanus                    Flatlands
##  [37] Cobble Hill                Flushing
##  [39] Boerum Hill                Sunnyside
##  [41] DUMBO                      St. George
##  [43] Highbridge                 Financial District
##  [45] Ridgewood                  Morningside Heights
##  [47] Jamaica                    Middle Village
##  [49] NoHo                       Ditmars Steinway
##  [51] Flatiron District          Roosevelt Island
##  [53] Greenwich Village          Little Italy
##  [55] East Flatbush              Tompkinsville
##  [57] Astoria                    Clason Point
##  [59] Eastchester                Kingsbridge
##  [61] Two Bridges                Queens Village
##  [63] Rockaway Beach             Forest Hills
##  [65] Nolita                     Woodlawn
##  [67] University Heights         Gravesend
##  [69] Gramercy                   Allerton
##  [71] East New York              Theater District
##  [73] Concourse Village          Sheepshead Bay
##  [75] Emerson Hill               Fort Hamilton
##  [77] Bensonhurst                Tribeca
##  [79] Shore Acres                Sunset Park
##  [81] Concourse                  Elmhurst
##  [83] Brighton Beach             Jackson Heights
##  [85] Cypress Hills              St. Albans
##  [87] Arrochar                   Rego Park
##  [89] Wakefield                  Clifton
##  [91] Bay Ridge                  Graniteville
##  [93] Spuyten Duyvil             Stapleton
##  [95] Briarwood                  Ozone Park
##  [97] Columbia St                Vinegar Hill
##  [99] Mott Haven                 Longwood
## [101] Canarsie                   Battery Park City
## [103] Civic Center               East Elmhurst
## [105] New Springville            Morris Heights
## [107] Arverne                    Cambria Heights
## [109] Tottenville                Mariners Harbor
## [111] Concord                    Borough Park
## [113] Bayside                    Downtown Brooklyn
```

```
## [115] Port Morris                Fieldston
## [117] Kew Gardens                Midwood
## [119] College Point              Mount Eden
## [121] City Island                Glendale
## [123] Port Richmond              Red Hook
## [125] Richmond Hill              Bellerose
## [127] Maspeth                    Williamsbridge
## [129] Soundview                  Woodhaven
## [131] Woodrow                    Co-op City
## [133] Stuyvesant Town            Parkchester
## [135] North Riverdale            Dyker Heights
## [137] Bronxdale                  Sea Gate
## [139] Riverdale                  Kew Gardens Hills
## [141] Bay Terrace                Norwood
## [143] Claremont Village          Whitestone
## [145] Fordham                    Bayswater
## [147] Navy Yard                  Brownsville
## [149] Eltingville                Fresh Meadows
## [151] Mount Hope                 Lighthouse Hill
## [153] Springfield Gardens        Howard Beach
## [155] Belle Harbor               Jamaica Estates
## [157] Van Nest                   Morris Park
## [159] West Brighton              Far Rockaway
## [161] South Ozone Park           Tremont
## [163] Corona                     Great Kills
## [165] Manhattan Beach            Marble Hill
## [167] Dongan Hills               Castleton Corners
## [169] East Morrisania            Hunts Point
## [171] Neponsit                   Pelham Bay
## [173] Randall Manor              Throgs Neck
## [175] Todt Hill                  West Farms
## [177] Silver Lake                Morrisania
## [179] Laurelton                  Grymes Hill
## [181] Holliswood                 Pelham Gardens
## [183] Belmont                    Rosedale
## [185] Edgemere                   New Brighton
## [187] Midland Beach              Baychester
## [189] Melrose                    Bergen Beach
## [191] Richmondtown               Howland Hook
## [193] Schuylerville              Coney Island
## [195] New Dorp Beach             Prince's Bay
## [197] South Beach                Bath Beach
## [199] Jamaica Hills              Oakwood
## [201] Castle Hill                Hollis
## [203] Douglaston                 Huguenot
## [205] Olinville                  Edenwald
## [207] Grant City                 Westerleigh
## [209] Bay Terrace, Staten Island Westchester Square
## [211] Little Neck                Fort Wadsworth
## [213] Rosebank                   Unionport
## [215] Mill Basin                 Arden Heights
## [217] Bull's Head                New Dorp
## [219] Rossville                  Breezy Point
## [221] Willowbrook
```

```
## 221 Levels: Allerton Arden Heights Arrochar Arverne Astoria ... Woodside
```

```
unique(dat$room_type)
```

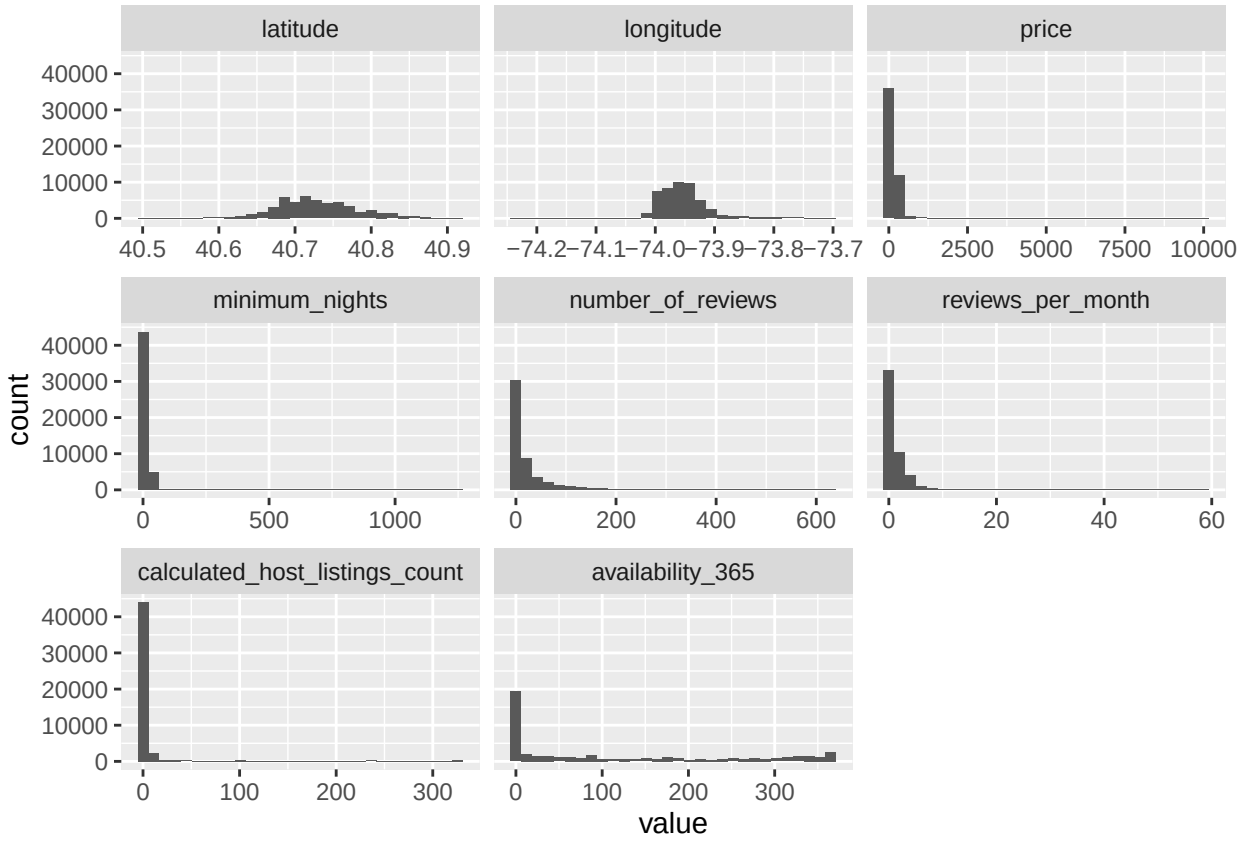
```
## [1] Private room    Entire home/apt Shared room
## Levels: Entire home/apt Private room Shared room
```

```
# EDA
# Histograms for numeric variables
d <- melt(dat[, names(dat) %in% col_num])
```

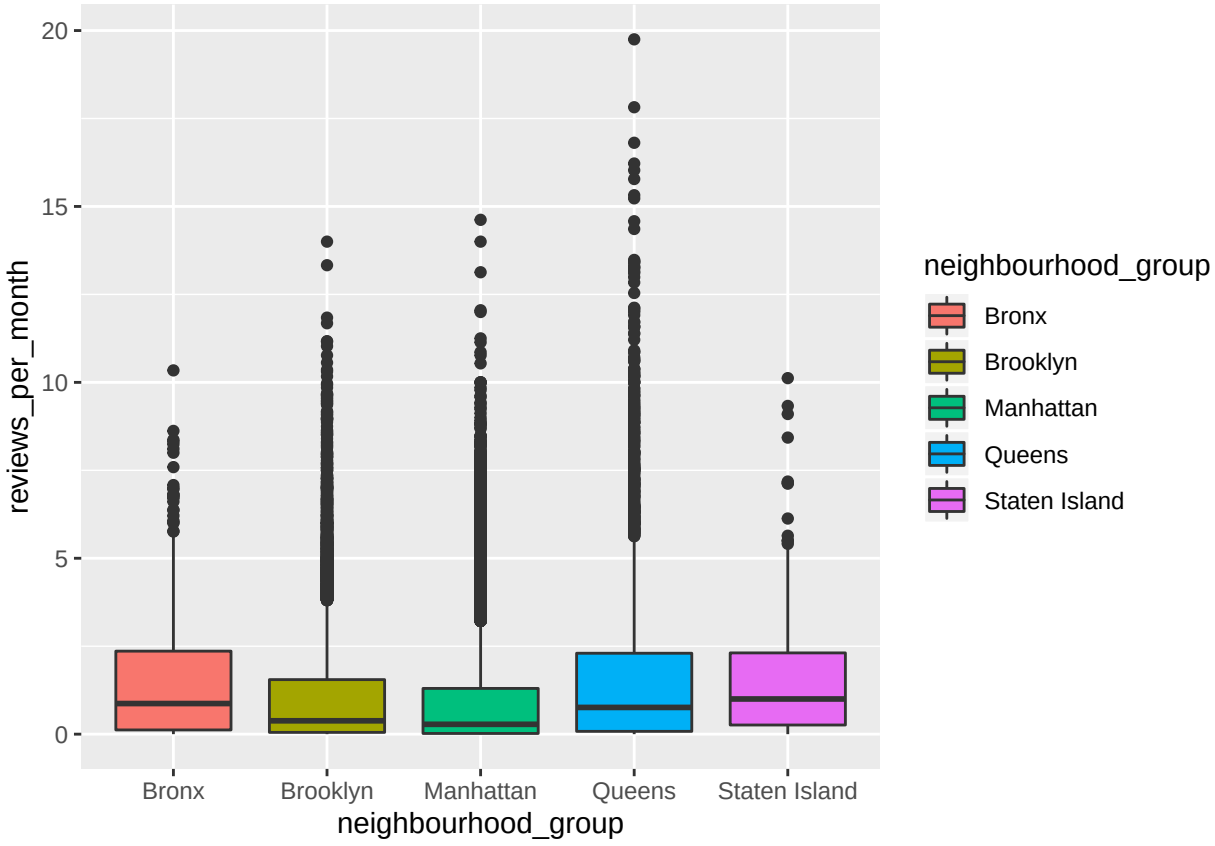
```
## No id variables; using all as measure variables
```

```
ggplot(d,aes(x = value)) +
    facet_wrap(~variable,scales = "free_x") +
    geom_histogram()
```

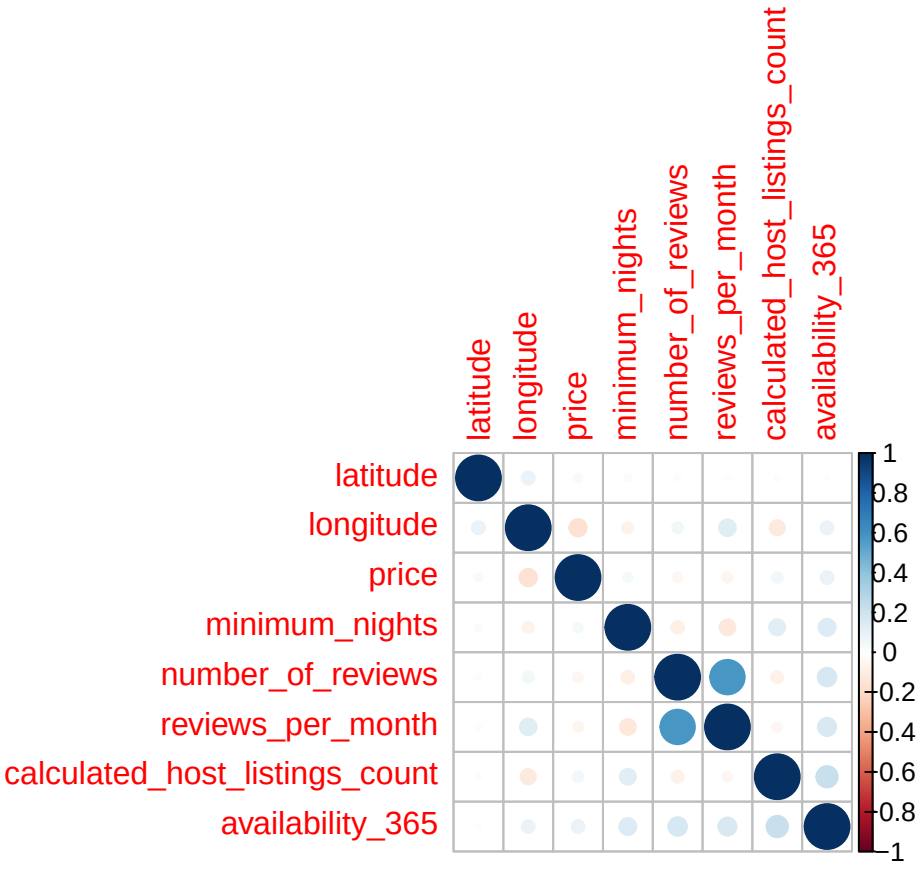
```
## `stat_bin()` using `bins = 30`. Pick better value with `binwidth`.
```




```
# Boxplots (remove extreme values to see distribution)
ggplot(dat[dat$reviews_per_month<=20,], aes(x=neighbourhood_group, y=reviews_per_month,
                                    fill=neighbourhood_group)) + geom_boxplot()
```

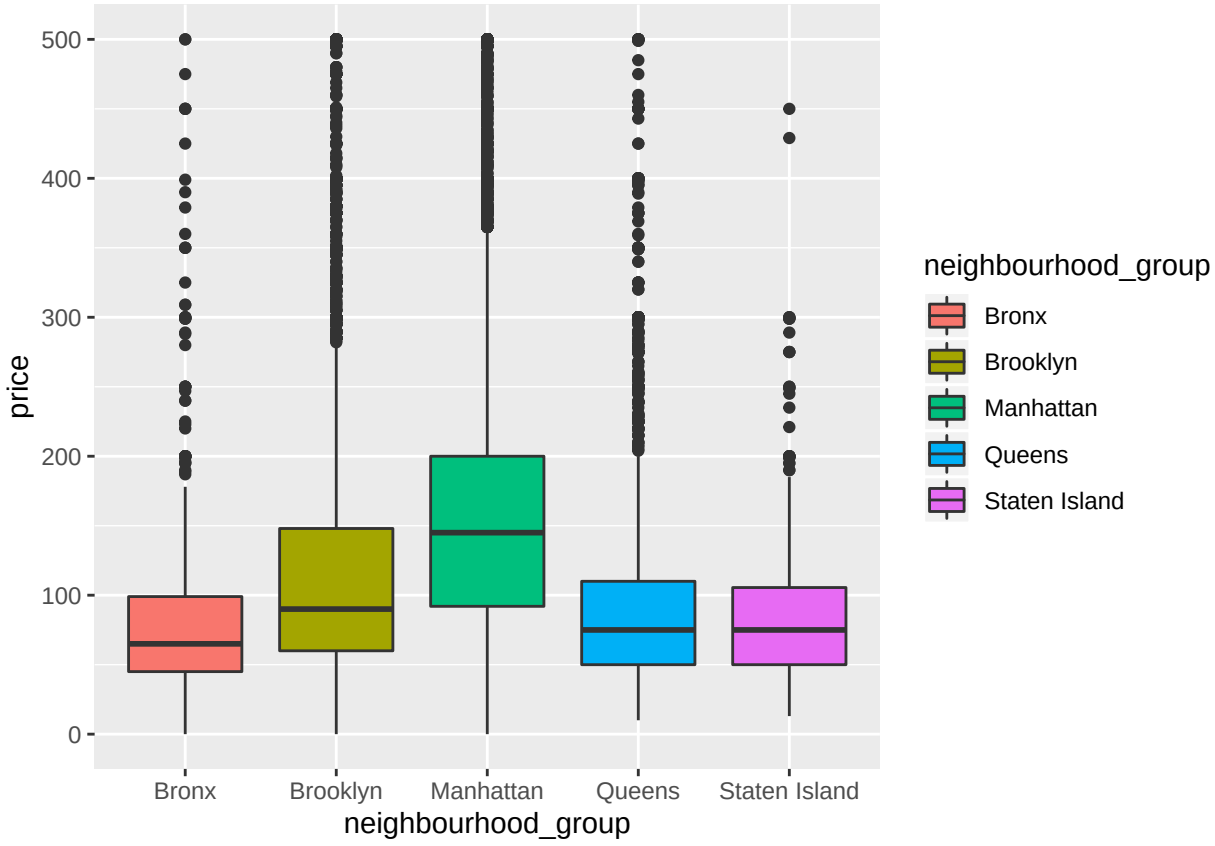



```
# Manhattan: highest price, fewest reviews

# Correlation plot
corrplot(cor(dat[, names(dat) %in% col_num]))
```




```
# only number_of_reviews & reviews_per_month have high correlation: expected

# Check if all listings under one host_id are in the same borough # but neighbourhood??
# table_host_borough <- table(dat$host_id, dat$neighbourhood_group)
# dat$host_id[which(apply(as.matrix(table_host_borough), 1, function(x) sum(x!=0))!=1)]
```

```
# Boxplots - price by borough (remove extreme values)
ggplot(dat[dat$price<=500,], aes(x=neighbourhood_group, y=price,
                                 fill=neighbourhood_group)) + geom_boxplot()
```



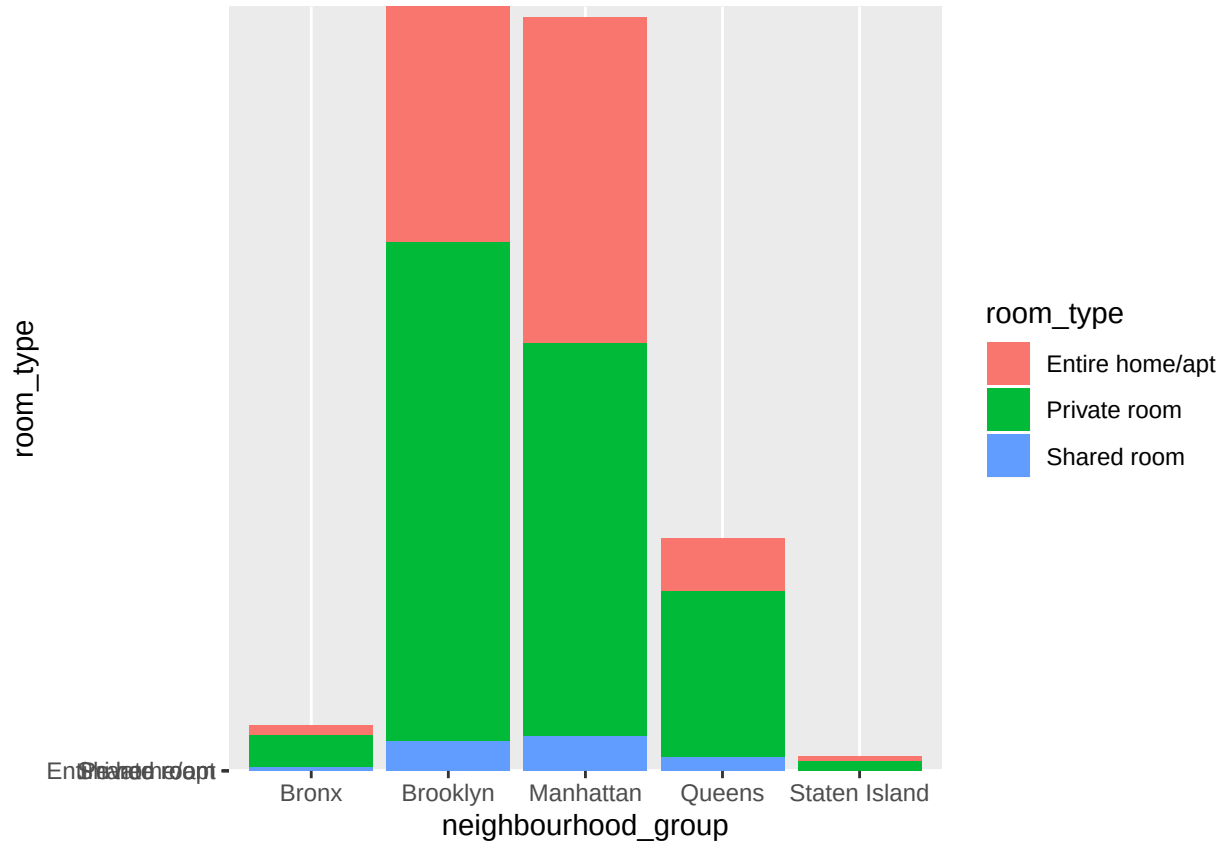

```
anova(lm(price~neighbourhood,data=dat))
```

```
## Analysis of Variance Table
##
## Response: price
##                  Df     Sum Sq Mean Sq F value    Pr(>F)
## neighbourhood   220  189750135  862501  15.961 < 2.2e-16 ***
## Residuals     48674 2630163656   54036
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

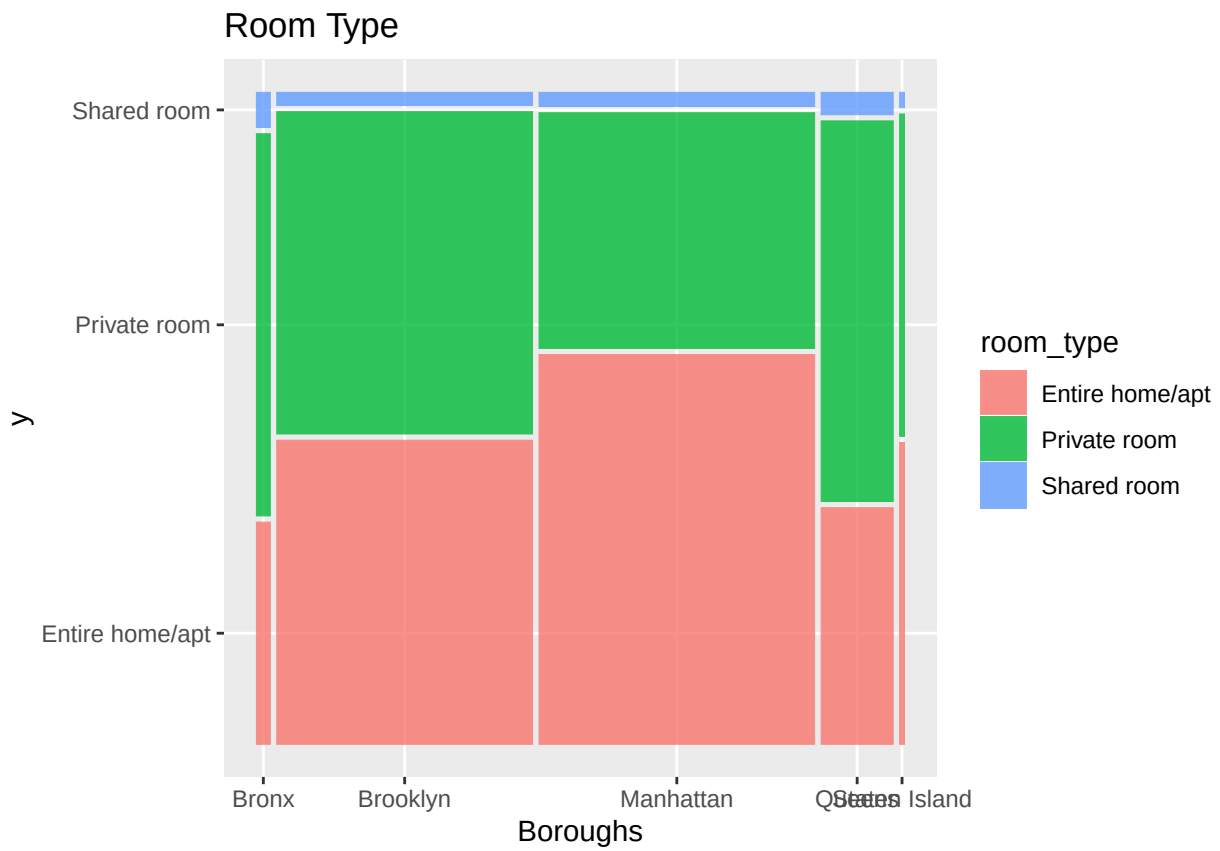
```
anova(lm(price~neighbourhood_group,data=dat))
```

```
## Analysis of Variance Table
##
## Response: price
##                        Df     Sum Sq  Mean Sq F value    Pr(>F)
## neighbourhood_group     4   79590956 19897739  354.99 < 2.2e-16 ***
## Residuals           48890 2740322834    56051
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

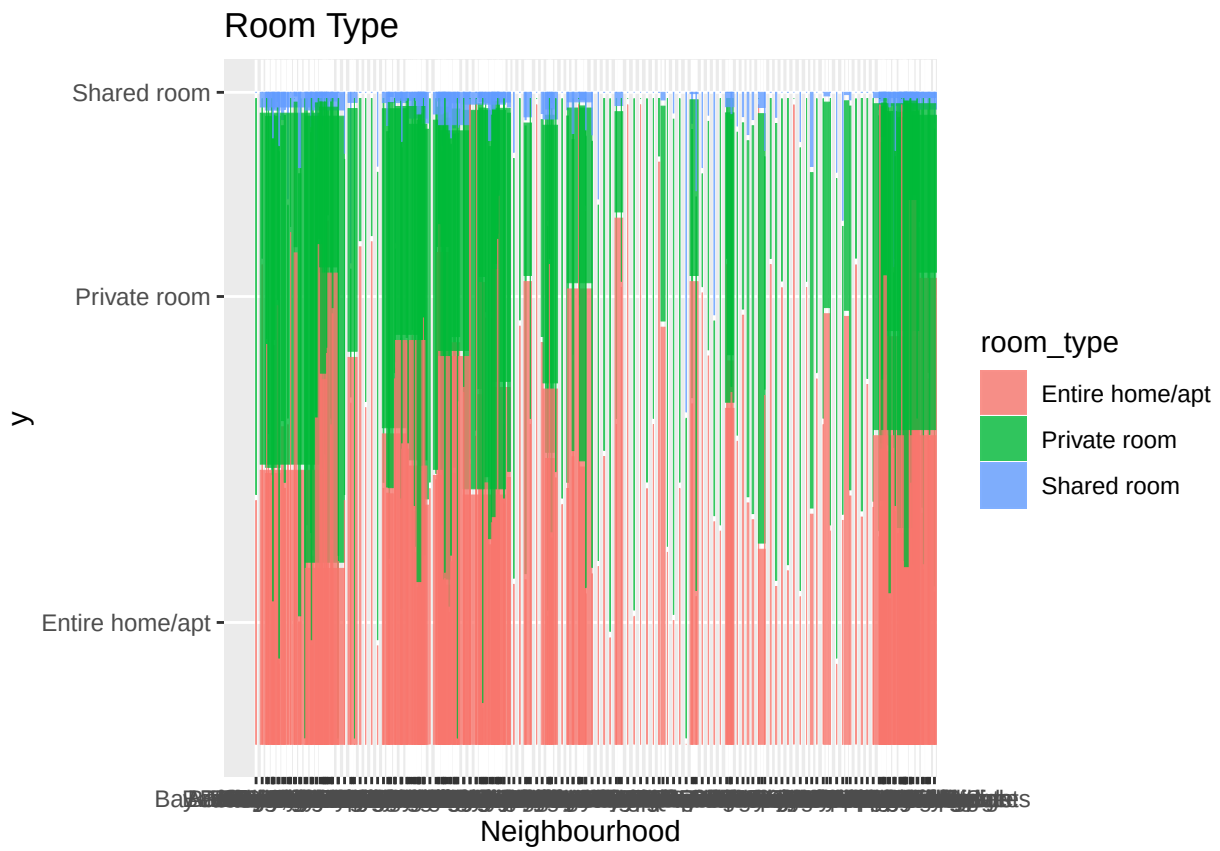
```
# Barplots & Mosaic plot - room type by borough
ggplot(data=dat, aes(x = neighbourhood_group, y = room_type, fill = room_type)) +
  geom_bar(stat="identity")
```



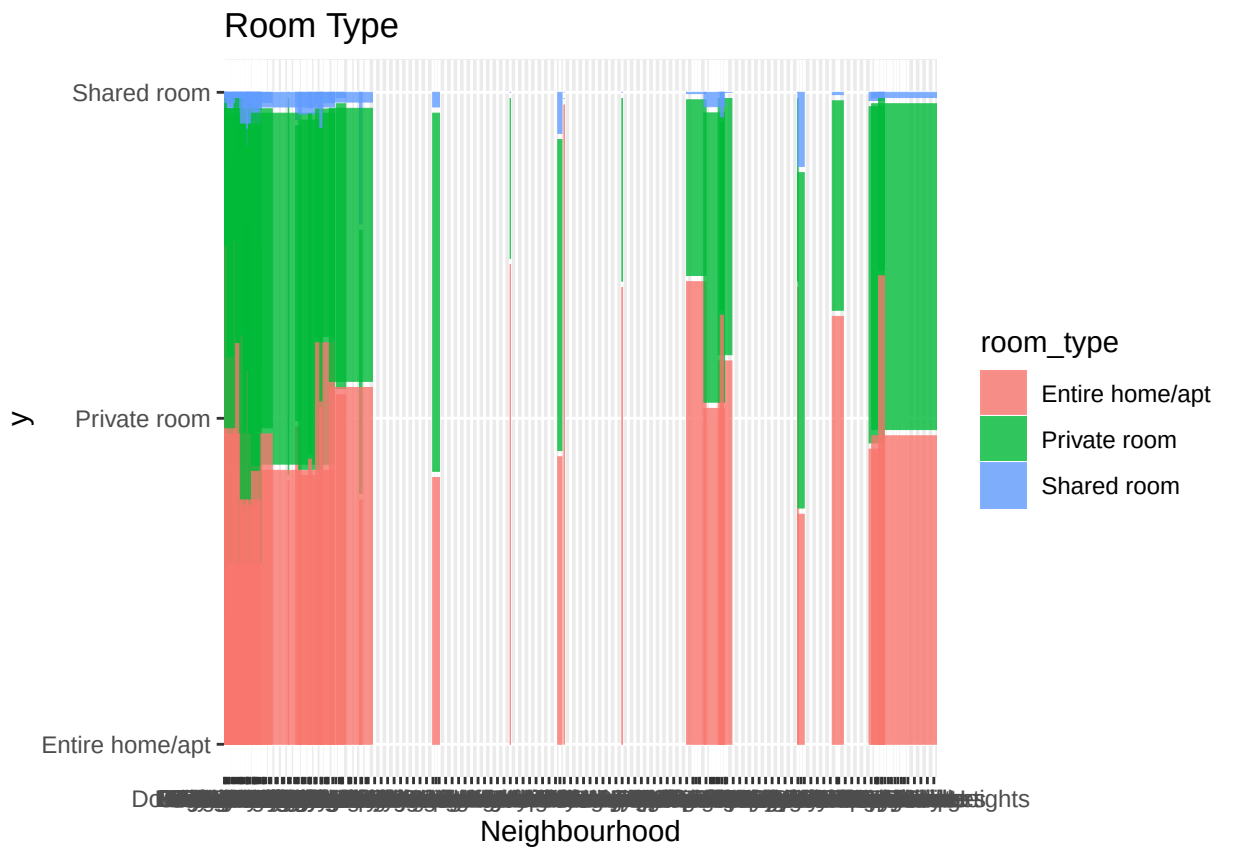

```
# boroughs
ggplot(data = dat) +
  geom_mosaic(aes(x = product(room_type, neighbourhood_group), fill=room_type), na.rm=TRUE) +
  labs(x="Boroughs", title='Room Type')
```



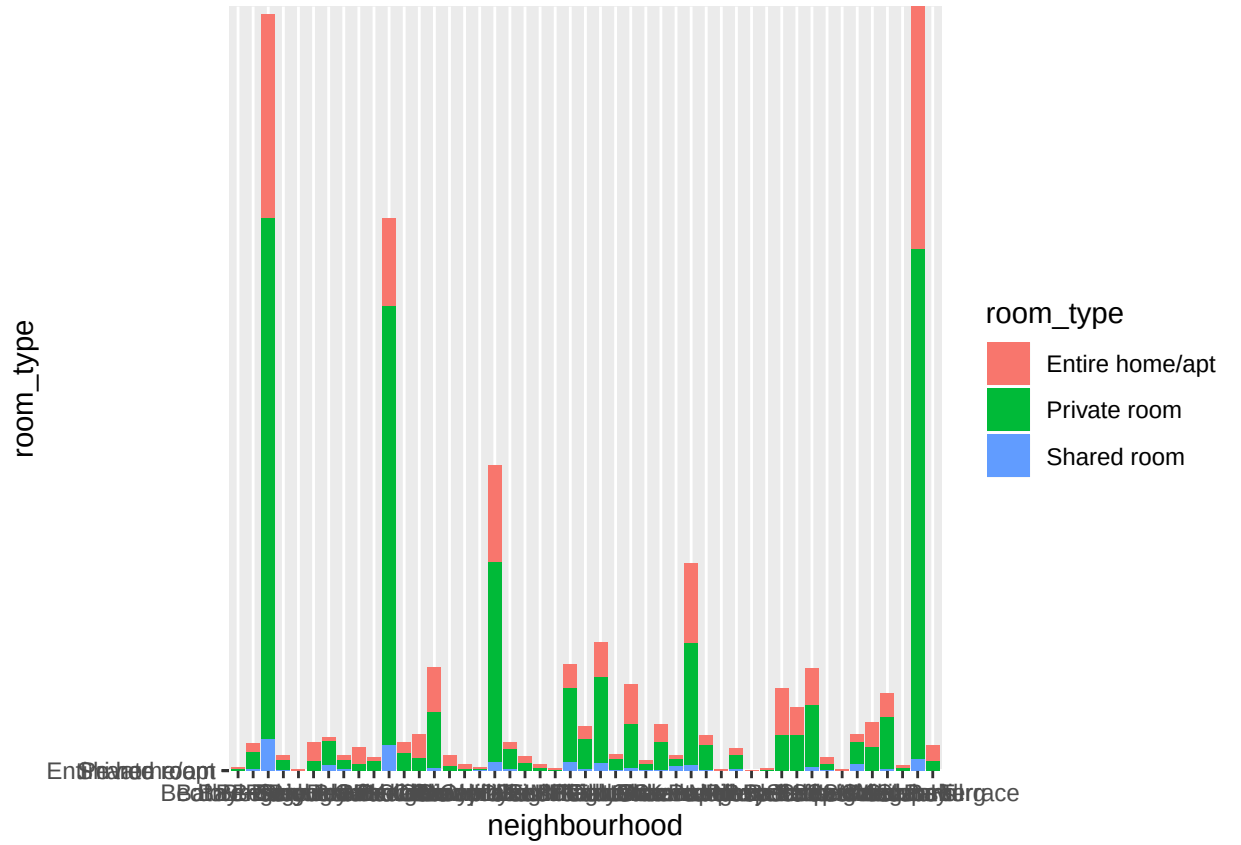

```
# all neighbourhood -> difficult to see
ggplot(data = dat) +
  geom_mosaic(aes(x = product(room_type, neighbourhood), fill=room_type), na.rm=TRUE) +
  labs(x="Neighbourhood", title='Room Type')
```




```
# plot by boroughs
ggplot(data = dat %>%
         filter(neighbourhood_group=="Brooklyn")) +
  geom_mosaic(aes(x = product(room_type, neighbourhood), fill=room_type), na.rm=TRUE) +
  labs(x="Neighbourhood", title='Room Type')
```




```
ggplot(data = dat %>%
         filter(neighbourhood_group=="Brooklyn"),
       aes(x = neighbourhood, y = room_type, fill = room_type)) +
       geom_bar(stat="identity")
```

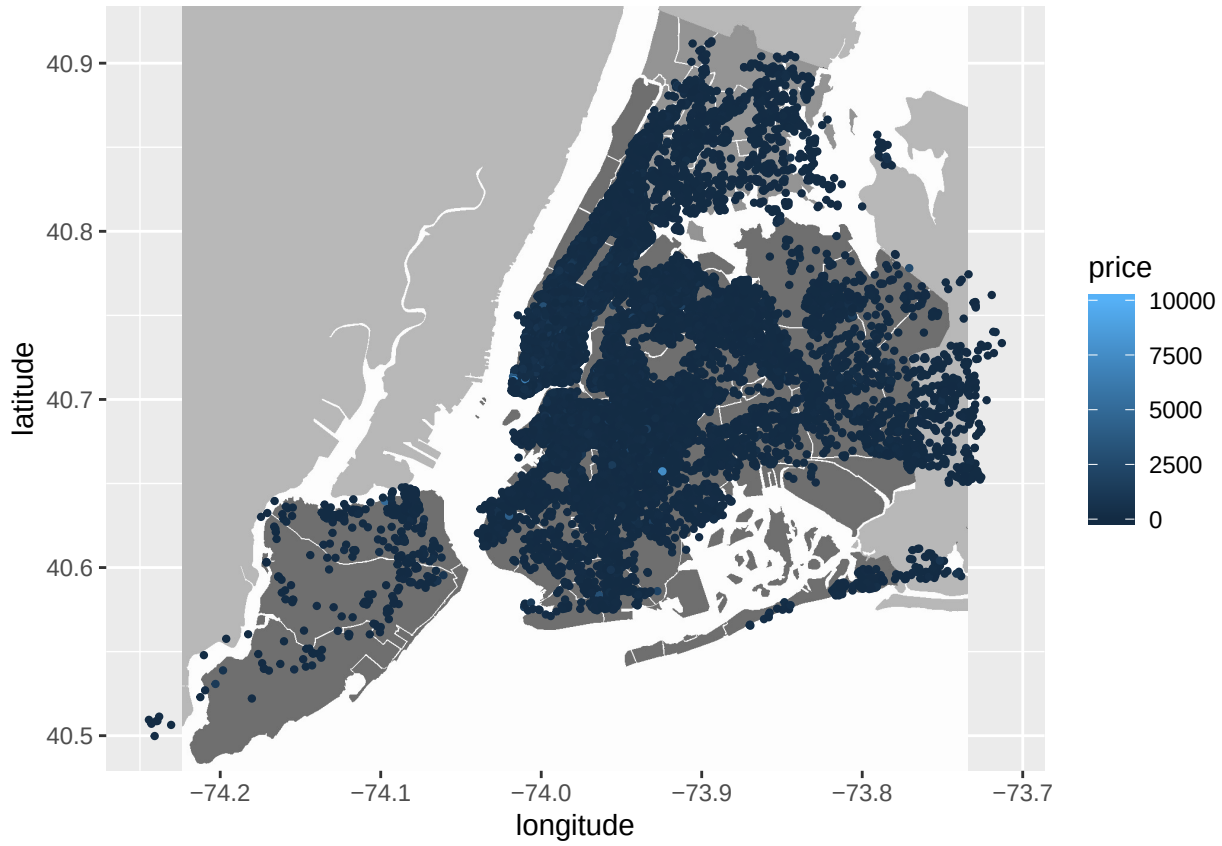



```
# Map
# library(jpeg)
# img<-readJPEG("New_York_City_.png")
# h<-dim(img)[1]
# w<-dim(img)[2]
#
# # Create map
# par(mar=c(0,0,0,0), xpd=NA, mgp=c(0,0,0), oma=c(0,0,0,0), ann=F)
# plot.new()
# plot.window(0:1, 0:1)
#
# # Fill plot with image
# usr<-par("usr")
# rasterImage(img, usr[1], usr[3], usr[2], usr[4])

library(magick)
```

```
## Linking to ImageMagick 6.9.9.39
## Enabled features: cairo, fontconfig, freetype, lcms, pango, rsvg, webp
## Disabled features: fftw, ghostscript, x11
```

```
library(grid)
img <- image_read("New_York_City_.png")
g <- rasterGrob(img)
```

```
ggplot() +
  annotation_custom(g) +
  geom_point(data = dat, mapping = aes(x = longitude, y = latitude, colour = price),size=0.8)
```




```
availability <- dat$availability_365==0
last_review_year <- as.numeric(substr(dat$last_review, start = 1, stop = 4))
review_per_month <- dat$reviews_per_month
table(last_review_year, availability)
```

```
##                 availability
## last_review_year FALSE  TRUE
##             2011     4     3
##             2012    15    10
##             2013    23    25
##             2014    52   147
##             2015   182  1211
##             2016   384  2323
##             2017   675  2530
##             2018  2699  3351
##             2019 22121  3088
```

```
table(review_per_month, availability)
```

```
##                 availability
```

```
## review_per_month FALSE TRUE
##             0      5207 4845
##             0.01     18   24
##             0.02     81  838
##             0.03    128  676
##             0.04    132  523
##             0.05    152  741
##             0.06    180  399
##             0.07    154  312
##             0.08    167  429
##             0.09    223  370
##             0.1     173  284
##             0.11    212  327
##             0.12    159  254
##             0.13    190  273
##             0.14    165  234
##             0.15    171  203
##             0.16    284  383
##             0.17    150  171
##             0.18    134  171
##             0.19    175  182
##             0.2     133  143
##             0.21    166  177
##             0.22    169  149
##             0.23    155  134
##             0.24    141  125
##             0.25    147  143
##             0.26    161  144
##             0.27    163  114
##             0.28    147  117
##             0.29    127  102
##             0.3     143  107
##             0.31    142  106
##             0.32    182   98
##             0.33    130   93
##             0.34    101   64
##             0.35     97   77
##             0.36    134   74
##             0.37    122   79
##             0.38    131   86
##             0.39    119   68
##             0.4     107   60
##             0.41    124   62
##             0.42    148   79
##             0.43    113   70
##             0.44    100   60
##             0.45    119   59
##             0.46    113   62
##             0.47    120   62
##             0.48    115   53
##             0.49     93   51
##             0.5      83   49
##             0.51     80   34
##             0.52     99   53
```

```
##            0.53    109   54
##            0.54     69   48
##            0.55     99   50
##            0.56     87   38
##            0.57     90   35
##            0.58    107   39
##            0.59    103   43
##            0.6      87   25
##            0.61     86   44
##            0.62     71   34
##            0.63     97   46
##            0.64     85   26
##            0.65     95   41
##            0.66     75   30
##            0.67     85   27
##            0.68     89   42
##            0.69     62   30
##            0.7     106   25
##            0.71     80   38
##            0.72     56   22
##            0.73     81   31
##            0.74     70   28
##            0.75     76   25
##            0.76     89   25
##            0.77    110   33
##            0.78     79   18
##            0.79     88   22
##            0.8      69   29
##            0.81     86   37
##            0.82     67   30
##            0.83     76   16
##            0.84     63   17
##            0.85     81   30
##            0.86     62   16
##            0.87     70   22
##            0.88     66   19
##            0.89     49   20
##            0.9      72   15
##            0.91     83   23
##            0.92     59   18
##            0.93     68   19
##            0.94     82   21
##            0.95     75   12
##            0.96     69   14
##            0.97     62   17
##            0.98     46   18
##            0.99     57   17
##            1       840   53
##            1.01     34   24
##            1.02     52   14
##            1.03     55   18
##            1.04     57   11
##            1.05     65   23
##            1.06     69   14
```

```
##            1.07     51   13
##            1.08     49   13
##            1.09     50   13
##            1.1      58    9
##            1.11     71   17
##            1.12     52   15
##            1.13     68   10
##            1.14     60   14
##            1.15     70   20
##            1.16     34   17
##            1.17     57    9
##            1.18     68   13
##            1.19     45   13
##            1.2      57   12
##            1.21     46   10
##            1.22     57   16
##            1.23     60    4
##            1.24     42   14
##            1.25     71    9
##            1.26     50   13
##            1.27     60    7
##            1.28     62    7
##            1.29     54    8
##            1.3      58   14
##            1.31     43    8
##            1.32     46    8
##            1.33     67   10
##            1.34     48   16
##            1.35     36    9
##            1.36     79    5
##            1.37     41    8
##            1.38     52    7
##            1.39     43    4
##            1.4      72   12
##            1.41     56   10
##            1.42     46    7
##            1.43     39   11
##            1.44     38    8
##            1.45     43    7
##            1.46     51   19
##            1.47     45    5
##            1.48     30   12
##            1.49     41   10
##            1.5      51    6
##            1.51     52   12
##            1.52     45    9
##            1.53     55    6
##            1.54     41    5
##            1.55     44   13
##            1.56     44    7
##            1.57     55    8
##            1.58     63    7
##            1.59     36    4
##            1.6      41    5
```

```
##            1.61     39   10
##            1.62     61    4
##            1.63     39    8
##            1.64     43    6
##            1.65     59    6
##            1.66     31    8
##            1.67     50   15
##            1.68     49    6
##            1.69     40    8
##            1.7      42   11
##            1.71     45    7
##            1.72     37    8
##            1.73     59    7
##            1.74     33    7
##            1.75     32    5
##            1.76     65   10
##            1.77     32    3
##            1.78     47    6
##            1.79     40    8
##            1.8      54    7
##            1.81     42    6
##            1.82     55    6
##            1.83     46    9
##            1.84     50    8
##            1.85     37    7
##            1.86     36    4
##            1.87     32    2
##            1.88     63    7
##            1.89     41    4
##            1.9      50   15
##            1.91     43    3
##            1.92     38    6
##            1.93     32    4
##            1.94     48    9
##            1.95     42    3
##            1.96     47    7
##            1.97     35    5
##            1.98     30    4
##            1.99     30    7
##            2       380   26
##            2.01     37    1
##            2.02     39    8
##            2.03     40    5
##            2.04     35    3
##            2.05     37    2
##            2.06     35    5
##            2.07     51    9
##            2.08     37    4
##            2.09     47    3
##            2.1      32    5
##            2.11     41    4
##            2.12     34    2
##            2.13     37    4
##            2.14     38    4
```

```
##            2.15     28    4
##            2.16     32    2
##            2.17     32    7
##            2.18     36    3
##            2.19     40    3
##            2.2      33    5
##            2.21     39    3
##            2.22     51    3
##            2.23     46    6
##            2.24     35    1
##            2.25     26    6
##            2.26     66    4
##            2.27     36    3
##            2.28     41    2
##            2.29     37    3
##            2.3      27    5
##            2.31     59    7
##            2.32     33    3
##            2.33     35    1
##            2.34     51    6
##            2.35     51    2
##            2.36     39    3
##            2.37     42    1
##            2.38     47    6
##            2.39     38    2
##            2.4      34    3
##            2.41     19    1
##            2.42     45    5
##            2.43     43    3
##            2.44     40    3
##            2.45     38    1
##            2.46     35    0
##            2.47     39    3
##            2.48     41    3
##            2.49     33    1
##            2.5      60    9
##            2.51     30    1
##            2.52     31    4
##            2.53     34    1
##            2.54     46    4
##            2.55     45    3
##            2.56     35    5
##            2.57     38    2
##            2.58     32    4
##            2.59     40    2
##            2.6      30    3
##            2.61     31    2
##            2.62     21    2
##            2.63     54    4
##            2.64     34    1
##            2.65     35    3
##            2.66     35    2
##            2.67     43    1
##            2.68     34    2
```

```
##            2.69     36    1
##            2.7      40    2
##            2.71     27    1
##            2.72     18    1
##            2.73     50    4
##            2.74     37    2
##            2.75     36    3
##            2.76     26    2
##            2.77     19    3
##            2.78     33    3
##            2.79     50    6
##            2.8      34    2
##            2.81     42    3
##            2.82     34    4
##            2.83     40    4
##            2.84     34    2
##            2.85     21    3
##            2.86     27    1
##            2.87     41    4
##            2.88     42    8
##            2.89     31    2
##            2.9      30    0
##            2.91     16    3
##            2.92     35    1
##            2.93     27    2
##            2.94     19    0
##            2.95     29    3
##            2.96     30    5
##            2.97     29    2
##            2.98     25    5
##            2.99     31    2
##            3       212   10
##            3.01     28    1
##            3.02     24    3
##            3.03     19    1
##            3.04     39    4
##            3.05     25    2
##            3.06     26    2
##            3.07     30    2
##            3.08     28    3
##            3.09     25    5
##            3.1      34    2
##            3.11     27    3
##            3.12     18    0
##            3.13     40    1
##            3.14     30    0
##            3.15     18    2
##            3.16     34    0
##            3.17     40    2
##            3.18     33    1
##            3.19     39    2
##            3.2      24    0
##            3.21     36    0
##            3.22     28    1
```

```
##            3.23     21    3
##            3.24     27    2
##            3.25     25    2
##            3.26     28    1
##            3.27     27    3
##            3.28     31    2
##            3.29     23    0
##            3.3      25    1
##            3.31     34    1
##            3.32     21    3
##            3.33     50    2
##            3.34     25    1
##            3.35     22    0
##            3.36     23    1
##            3.37     27    1
##            3.38     25    3
##            3.39     17    0
##            3.4      31    0
##            3.41     18    2
##            3.42     37    0
##            3.43     19    2
##            3.44     28    0
##            3.45     24    2
##            3.46     26    1
##            3.47     22    2
##            3.48     15    1
##            3.49     20    0
##            3.5      25    2
##            3.51     24    0
##            3.52     24    2
##            3.53     36    2
##            3.54     13    2
##            3.55     25    1
##            3.56     17    0
##            3.57     16    2
##            3.58     20    1
##            3.59     30    0
##            3.6      18    3
##            3.61     26    0
##            3.62     19    1
##            3.63     29    1
##            3.64     24    3
##            3.65     24    2
##            3.66     25    1
##            3.67     22    1
##            3.68     21    4
##            3.69     30    0
##            3.7      24    1
##            3.71     20    2
##            3.72     22    4
##            3.73     16    0
##            3.74     16    1
##            3.75     39    3
##            3.76      7    1
```

```
##            3.77     12    3
##            3.78     18    3
##            3.79     27    1
##            3.8      28    0
##            3.81      9    1
##            3.82     16    2
##            3.83     13    1
##            3.84     13    1
##            3.85     25    1
##            3.86     20    2
##            3.87     15    1
##            3.88     26    0
##            3.89     15    1
##            3.9      20    0
##            3.91     19    0
##            3.92     14    0
##            3.93     27    2
##            3.94     22    1
##            3.95     22    0
##            3.96     16    1
##            3.97     21    1
##            3.98     13    4
##            3.99     12    0
##            4       125    5
##            4.01     16    0
##            4.02     16    0
##            4.03     16    0
##            4.04     22    0
##            4.05     18    0
##            4.06     17    1
##            4.07     19    2
##            4.08     18    0
##            4.09     24    1
##            4.1      20    1
##            4.11     15    0
##            4.12     17    1
##            4.13     17    0
##            4.14     18    1
##            4.15     18    2
##            4.16     16    0
##            4.17     17    3
##            4.18     14    2
##            4.19     21    0
##            4.2      14    1
##            4.21     25    2
##            4.22     13    1
##            4.23     17    0
##            4.24     13    0
##            4.25     18    0
##            4.26     18    1
##            4.27     13    0
##            4.28      4    0
##            4.29     36    4
##            4.3       6    0
```

```
##            4.31     12    1
##            4.32      7    1
##            4.33     15    0
##            4.34     17    2
##            4.35     13    2
##            4.36     22    1
##            4.37     16    0
##            4.38     15    2
##            4.39      8    2
##            4.4      12    1
##            4.41     11    0
##            4.42     11    0
##            4.43     14    2
##            4.44     23    1
##            4.45     13    0
##            4.46     12    1
##            4.47     17    0
##            4.48     17    0
##            4.49     17    1
##            4.5      18    1
##            4.51     10    2
##            4.52     18    2
##            4.53     11    2
##            4.54      8    0
##            4.55     18    2
##            4.56      7    0
##            4.57     17    0
##            4.58     22    1
##            4.59     16    1
##            4.6       7    0
##            4.61      5    0
##            4.62     24    2
##            4.63     10    3
##            4.64     12    0
##            4.65     13    0
##            4.66     13    2
##            4.67     12    1
##            4.68      8    0
##            4.69     20    0
##            4.7       6    0
##            4.71     10    0
##            4.72      7    3
##            4.73     17    0
##            4.74     16    0
##            4.75      6    1
##            4.76     11    1
##            4.77     12    1
##            4.78     13    0
##            4.79     12    1
##            4.8       9    0
##            4.81     11    0
##            4.82     14    0
##            4.83      9    1
##            4.84      9    1
```

```
##            4.85      4    2
##            4.86     13    0
##            4.87      7    0
##            4.88     11    0
##            4.89     11    1
##            4.9       9    1
##            4.91     10    0
##            4.92      9    1
##            4.93     16    2
##            4.94      9    0
##            4.95      9    1
##            4.96     12    0
##            4.97      9    0
##            4.98      7    0
##            4.99      4    0
##            5        79    6
##            5.01      6    0
##            5.02      8    0
##            5.03     11    0
##            5.04     10    0
##            5.05      8    0
##            5.06      8    0
##            5.07      5    0
##            5.08     12    0
##            5.09      5    1
##            5.1       7    0
##            5.11     14    0
##            5.12     11    0
##            5.13      7    0
##            5.14      7    0
##            5.15      3    1
##            5.16      8    2
##            5.17      8    1
##            5.18      5    1
##            5.19     10    1
##            5.2      12    0
##            5.21      4    0
##            5.22      9    0
##            5.23      5    1
##            5.24      5    0
##            5.25      8    0
##            5.26      9    0
##            5.27     10    1
##            5.28      9    0
##            5.29      6    1
##            5.3       5    0
##            5.31      8    1
##            5.32      5    0
##            5.33      7    0
##            5.34      8    0
##            5.35      9    0
##            5.36      4    0
##            5.37     16    0
##            5.38      9    0
```

```
##            5.39      8    0
##            5.4       7    0
##            5.41      5    0
##            5.42      9    0
##            5.43      5    0
##            5.44      7    0
##            5.45     19    0
##            5.46      4    0
##            5.47      3    1
##            5.48      2    0
##            5.49      6    1
##            5.5       8    0
##            5.51      6    0
##            5.52      3    0
##            5.53      5    0
##            5.54     10    0
##            5.55      4    0
##            5.56      8    0
##            5.57      4    0
##            5.58      6    0
##            5.59     10    0
##            5.6       5    0
##            5.61      6    0
##            5.62      6    0
##            5.63      7    1
##            5.64      6    0
##            5.65      6    2
##            5.66      4    0
##            5.67      5    0
##            5.68      5    0
##            5.69      4    1
##            5.7       6    1
##            5.71      6    0
##            5.72      1    0
##            5.73      7    0
##            5.74      7    1
##            5.75      5    0
##            5.76      1    0
##            5.77      4    0
##            5.78      7    1
##            5.79      6    0
##            5.8       5    0
##            5.81      8    0
##            5.82      7    0
##            5.83     10    1
##            5.84      3    1
##            5.85      3    0
##            5.86      3    0
##            5.87      8    0
##            5.88      6    1
##            5.89      4    1
##            5.9       6    0
##            5.91      4    1
##            5.92      8    0
```

```
##            5.93      3    0
##            5.94      5    0
##            5.95      8    1
##            5.96      3    0
##            5.97      3    1
##            5.98      4    0
##            5.99      4    0
##            6        37    2
##            6.01      1    1
##            6.02      3    1
##            6.03      5    0
##            6.04      0    1
##            6.05      5    0
##            6.06      1    0
##            6.07      5    0
##            6.08      5    0
##            6.09      3    1
##            6.1       6    0
##            6.11      5    0
##            6.12      3    0
##            6.13      5    0
##            6.14      2    0
##            6.15      3    0
##            6.17      2    0
##            6.18      4    0
##            6.19      8    0
##            6.2       4    0
##            6.21      3    1
##            6.22      4    0
##            6.23      8    0
##            6.24      1    0
##            6.25      3    1
##            6.26      2    0
##            6.27      1    1
##            6.28      3    0
##            6.29      1    0
##            6.3       3    0
##            6.31      5    0
##            6.32      6    1
##            6.34      3    0
##            6.35      4    0
##            6.36      5    0
##            6.37      3    0
##            6.38      6    0
##            6.39      1    0
##            6.4       3    0
##            6.41      1    0
##            6.42      3    0
##            6.43      6    0
##            6.44      3    0
##            6.45      5    0
##            6.46      8    0
##            6.47      1    0
##            6.48      3    0
```

```
##            6.49      3    0
##            6.5       3    0
##            6.51      6    0
##            6.52      2    0
##            6.53      1    0
##            6.54      3    0
##            6.55      4    0
##            6.56      4    0
##            6.57      1    0
##            6.58      1    0
##            6.59      6    0
##            6.6       1    0
##            6.61      3    1
##            6.62      3    0
##            6.63      1    0
##            6.64      3    0
##            6.65      2    0
##            6.67      8    0
##            6.68      3    0
##            6.69      1    0
##            6.7       2    1
##            6.71      4    0
##            6.72      2    1
##            6.73      2    1
##            6.74      1    0
##            6.75      2    0
##            6.76      2    0
##            6.77      3    0
##            6.78      4    0
##            6.79      3    0
##            6.8       5    0
##            6.82      3    0
##            6.83      2    0
##            6.84      2    0
##            6.86      2    0
##            6.87      2    0
##            6.88      1    1
##            6.9       3    0
##            6.91      1    0
##            6.92      4    1
##            6.94      2    0
##            6.95      2    0
##            6.96      3    0
##            6.97      3    0
##            6.99      2    0
##            7        17    0
##            7.01      3    0
##            7.02      2    0
##            7.03      3    0
##            7.04      2    0
##            7.05      1    0
##            7.06      2    0
##            7.07      3    0
##            7.08      4    0
```

```
##            7.1       1    0
##            7.11      1    1
##            7.12      3    1
##            7.13      4    0
##            7.14      6    0
##            7.16      1    0
##            7.17      2    0
##            7.18      4    0
##            7.19      2    0
##            7.2       1    1
##            7.21      1    0
##            7.22      2    0
##            7.23      1    0
##            7.24      4    1
##            7.25      1    0
##            7.26      3    0
##            7.27      5    1
##            7.28      3    0
##            7.29      1    0
##            7.3       2    0
##            7.31      2    0
##            7.32      1    0
##            7.33      4    0
##            7.34      2    0
##            7.36      2    0
##            7.38      2    1
##            7.39      2    0
##            7.41      2    0
##            7.42      1    0
##            7.43      2    0
##            7.45      1    0
##            7.47      2    1
##            7.5      15    0
##            7.53      2    0
##            7.55      3    0
##            7.56      2    0
##            7.57      4    0
##            7.58      2    0
##            7.59      4    0
##            7.6       2    0
##            7.61      1    0
##            7.63      1    0
##            7.64      4    0
##            7.65      2    0
##            7.66      2    0
##            7.67      3    0
##            7.69      4    0
##            7.7       2    0
##            7.71      3    0
##            7.72      2    0
##            7.75      2    0
##            7.76      2    0
##            7.77      2    0
##            7.79      3    1
```

```
##             7.83      3    0
##             7.84      1    0
##             7.85      1    0
##             7.86      1    0
##             7.87      2    0
##             7.88      2    0
##             7.89      3    0
##             7.9       1    0
##             7.91      1    0
##             7.92      2    0
##             7.94      2    0
##             7.96      4    0
##             7.97      2    0
##             7.98      2    0
##             7.99      1    0
##             8         8    0
##             8.02      3    0
##             8.03      2    0
##             8.06      2    0
##             8.07      1    0
##             8.11      1    0
##             8.14      1    0
##             8.16      1    0
##             8.17      1    0
##             8.18      3    0
##             8.21      2    0
##             8.24      3    1
##             8.25      1    0
##             8.27      2    0
##             8.29      2    0
##             8.31      2    0
##             8.32      2    0
##             8.33      3    0
##             8.35      1    0
##             8.37      1    0
##             8.38      2    0
##             8.4       1    0
##             8.43      1    0
##             8.44      2    0
##             8.45      1    0
##             8.47      1    0
##             8.48      3    0
##             8.5       1    0
##             8.51      1    0
##             8.52      2    0
##             8.56      0    2
##             8.57      2    0
##             8.58      1    0
##             8.62      3    0
##             8.64      1    1
##             8.68      1    0
##             8.69      1    0
##             8.72      1    0
##             8.73      1    0
```

```
##            8.74      1    0
##            8.75      1    0
##            8.79      1    0
##            8.82      2    0
##            8.84      0    1
##            8.86      1    1
##            8.87      4    0
##            8.92      1    0
##            8.93      1    0
##            8.94      1    0
##            8.95      3    0
##            8.97      1    1
##            8.99      1    0
##            9         3    0
##            9.03      1    0
##            9.07      2    0
##            9.08      1    0
##            9.09      2    0
##            9.1       1    0
##            9.12      1    0
##            9.13      2    0
##            9.15      1    0
##            9.16      1    0
##            9.17      2    0
##            9.21      1    0
##            9.23      1    0
##            9.24      1    0
##            9.26      1    0
##            9.29      1    0
##            9.3       2    0
##            9.33      1    0
##            9.34      1    0
##            9.36      1    0
##            9.39      2    0
##            9.4       1    0
##            9.41      2    0
##            9.43      1    0
##            9.47      3    0
##            9.5       1    0
##            9.53      1    0
##            9.56      1    0
##            9.58      2    0
##            9.61      1    0
##            9.62      1    0
##            9.63      2    0
##            9.64      2    0
##            9.66      1    0
##            9.67      1    0
##            9.68      1    0
##            9.73      0    1
##            9.74      1    0
##            9.78      1    0
##            9.82      1    0
##            9.83      1    0
```

```
##             9.85      2    0
##             9.93      1    0
##             9.97      0    1
##             10        6    2
##             10.05     1    0
##             10.12     1    0
##             10.15     1    0
##             10.17     2    0
##             10.19     2    0
##             10.23     1    0
##             10.28     1    0
##             10.29     0    1
##             10.31     1    0
##             10.34     1    0
##             10.36     1    0
##             10.37     1    0
##             10.38     1    0
##             10.39     1    0
##             10.54     1    0
##             10.56     1    0
##             10.6      2    0
##             10.64     1    0
##             10.67     1    0
##             10.72     1    0
##             10.77     1    1
##             10.86     3    0
##             10.91     1    0
##             11.03     1    0
##             11.14     1    0
##             11.16     1    0
##             11.17     1    0
##             11.21     1    0
##             11.25     1    0
##             11.38     1    0
##             11.4      1    0
##             11.56     1    0
##             11.59     2    0
##             11.68     1    0
##             11.71     1    0
##             11.72     0    1
##             11.84     1    0
##             11.91     1    0
##             12        2    0
##             12.05     2    0
##             12.11     1    0
##             12.12     1    0
##             12.54     1    0
##             12.84     1    0
##             12.99     1    0
##             13.11     1    0
##             13.13     1    0
##             13.15     1    0
##             13.24     0    1
##             13.27     1    0
```

```
##             13.3      1    0
##             13.33     1    0
##             13.4      1    0
##             13.42     1    0
##             13.45     1    0
##             13.48     1    0
##             14        2    0
##             14.36     1    0
##             14.58     1    0
##             14.62     1    0
##             15.23     1    0
##             15.32     1    0
##             15.78     1    0
##             16.03     1    0
##             16.22     1    0
##             16.81     1    0
##             17.82     1    0
##             19.75     1    0
##             20.94     1    0
##             27.95     1    0
##             58.5      1    0
```