# Rworksheet_Esmalla#4c

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1a. Show your solutions on how to import a csv file into the environment.

```
library(readr)
mpg_file <- read_csv("mpg.csv")
```

```
## New names:
## Rows: 234 Columns: 12
## -- Column specification
## -------------------------------------------------------- Delimiter: "," chr
## (6): manufacturer, model, trans, drv, fl, class dbl (6): ...1, displ, year,
## cyl, cty, hwy
## i Use `spec()` to retrieve the full column specification for this data. i
## Specify the column types or set `show_col_types = FALSE` to quiet this message.
## * `` -> `...1`
```

```
mpg_file
```

```
## # A tibble: 234 x 12
##     ...1 manufacturer model      displ  year   cyl trans drv     cty   hwy fl
##    <dbl> <chr>        <chr>      <dbl> <dbl> <dbl> <chr> <chr> <dbl> <dbl> <chr>
##  1     1 audi         a4           1.8  1999     4 auto~ f        18    29 p
##  2     2 audi         a4           1.8  1999     4 manu~ f        21    29 p
##  3     3 audi         a4           2    2008     4 manu~ f        20    31 p
##  4     4 audi         a4           2    2008     4 auto~ f        21    30 p
##  5     5 audi         a4           2.8  1999     6 auto~ f        16    26 p
##  6     6 audi         a4           2.8  1999     6 manu~ f        18    26 p
##  7     7 audi         a4           3.1  2008     6 auto~ f        18    27 p
##  8     8 audi         a4 quattro   1.8  1999     4 manu~ 4        18    26 p
##  9     9 audi         a4 quattro   1.8  1999     4 auto~ 4        16    25 p
## 10    10 audi         a4 quattro   2    2008     4 manu~ 4        20    28 p
## # i 224 more rows
## # i 1 more variable: class <chr>
```

1b.Which variables from mpg dataset are categorical? –>

```
str(mpg_file)
```

```
## spc_tbl_ [234 x 12] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
##  $ ...1        : num [1:234] 1 2 3 4 5 6 7 8 9 10 ...
##  $ manufacturer: chr [1:234] "audi" "audi" "audi" "audi" ...
##  $ model       : chr [1:234] "a4" "a4" "a4" "a4" ...
##  $ displ       : num [1:234] 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
##  $ year        : num [1:234] 1999 1999 2008 2008 1999 ...
##  $ cyl         : num [1:234] 4 4 4 4 6 6 6 4 4 4 ...
##  $ trans       : chr [1:234] "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
```

```
##  $ drv         : chr [1:234] "f" "f" "f" "f" ...
##  $ cty         : num [1:234] 18 21 20 21 16 18 18 18 16 20 ...
##  $ hwy         : num [1:234] 29 29 31 30 26 26 27 26 25 28 ...
##  $ fl          : chr [1:234] "p" "p" "p" "p" ...
##  $ class       : chr [1:234] "compact" "compact" "compact" "compact" ...
##  - attr(*, "spec")=
##   .. cols(
##   ..   ...1 = col_double(),
##   ..   manufacturer = col_character(),
##   ..   model = col_character(),
##   ..   displ = col_double(),
##   ..   year = col_double(),
##   ..   cyl = col_double(),
##   ..   trans = col_character(),
##   ..   drv = col_character(),
##   ..   cty = col_double(),
##   ..   hwy = col_double(),
##   ..   fl = col_character(),
##   ..   class = col_character()
##   .. )
##  - attr(*, "problems")=<externalptr>
```

```
categorical_vars <- c("manufacturer", "model", "year", "cyl", "trans", "drv", "fl", "class")
cat("Categorical variables:", categorical_vars, "\n")
```

```
## Categorical variables: manufacturer model year cyl trans drv fl class
```

1c. Which are continuous variables?

```
 str(mpg_file)
```

```
## spc_tbl_ [234 x 12] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
##  $ ...1        : num [1:234] 1 2 3 4 5 6 7 8 9 10 ...
##  $ manufacturer: chr [1:234] "audi" "audi" "audi" "audi" ...
##  $ model       : chr [1:234] "a4" "a4" "a4" "a4" ...
##  $ displ       : num [1:234] 1.8 1.8 2 2 2.8 2.8 3.1 1.8 1.8 2 ...
##  $ year        : num [1:234] 1999 1999 2008 2008 1999 ...
##  $ cyl         : num [1:234] 4 4 4 4 6 6 6 4 4 4 ...
##  $ trans       : chr [1:234] "auto(l5)" "manual(m5)" "manual(m6)" "auto(av)" ...
##  $ drv         : chr [1:234] "f" "f" "f" "f" ...
##  $ cty         : num [1:234] 18 21 20 21 16 18 18 18 16 20 ...
##  $ hwy         : num [1:234] 29 29 31 30 26 26 27 26 25 28 ...
##  $ fl          : chr [1:234] "p" "p" "p" "p" ...
##  $ class       : chr [1:234] "compact" "compact" "compact" "compact" ...
##  - attr(*, "spec")=
##   .. cols(
##   ..   ...1 = col_double(),
##   ..   manufacturer = col_character(),
##   ..   model = col_character(),
##   ..   displ = col_double(),
##   ..   year = col_double(),
##   ..   cyl = col_double(),
##   ..   trans = col_character(),
##   ..   drv = col_character(),
##   ..   cty = col_double(),
##   ..   hwy = col_double(),
```

```
##   ..   fl = col_character(),
##   ..   class = col_character()
##   .. )
##  - attr(*, "problems")=<externalptr>
```

```
continuous_vars <- c("displ", "cty", "hwy")
cat("Continuous variables:", continuous_vars, "\n")
```

```
## Continuous variables: displ cty hwy
```

2. Which manufacturer has the most models in this data set? Which model has the most variations? Show your answer.

```
manufacturer_asTable <- table(mpg_file$manufacturer)
names(manufacturer_asTable)[which.max(manufacturer_asTable)]
```

```
## [1] "dodge"
```

```
# dodge manufacturer has the most models
model_asTable <- table(mpg_file$model)

model_asTable
```

```
##
##            4runner 4wd                    a4            a4 quattro
##                      6                     7                     8
##             a6 quattro                altima    c1500 suburban 2wd
##                      3                     6                     5
##                  camry           camry solara           caravan 2wd
##                      7                     7                    11
##                  civic               corolla              corvette
##                      9                     5                     5
##      dakota pickup 4wd           durango 4wd        expedition 2wd
##                      9                     7                     3
##           explorer 4wd       f150 pickup 4wd          forester awd
##                      6                     7                     6
##     grand cherokee 4wd            grand prix                   gti
##                      8                     5                     5
##            impreza awd                 jetta       k1500 tahoe 4wd
##                      8                     9                     4
## land cruiser wagon 4wd                malibu                maxima
##                      2                     5                     3
##        mountaineer 4wd               mustang         navigator 2wd
##                      4                     9                     3
##             new beetle                passat        pathfinder 4wd
##                      6                     7                     4
##    ram 1500 pickup 4wd           range rover                sonata
##                     10                     4                     7
##                tiburon     toyota tacoma 4wd
##                      7                     7
```

```
names(model_asTable)[which.max(model_asTable)]
```

```
## [1] "caravan 2wd"
```

```
# caravan 2wd has the most variations
```

2.a Group the manufacturers and find the unique models. Show your codes and result.

```r
manufacturers_models <- data.frame(Manufacturer = mpg_file$manufacturer, Model = mpg_file$model)
manufacturers_models
```

```
##     Manufacturer                 Model
## 1           audi                    a4
## 2           audi                    a4
## 3           audi                    a4
## 4           audi                    a4
## 5           audi                    a4
## 6           audi                    a4
## 7           audi                    a4
## 8           audi             a4 quattro
## 9           audi             a4 quattro
## 10          audi             a4 quattro
## 11          audi             a4 quattro
## 12          audi             a4 quattro
## 13          audi             a4 quattro
## 14          audi             a4 quattro
## 15          audi             a4 quattro
## 16          audi             a6 quattro
## 17          audi             a6 quattro
## 18          audi             a6 quattro
## 19     chevrolet     c1500 suburban 2wd
## 20     chevrolet     c1500 suburban 2wd
## 21     chevrolet     c1500 suburban 2wd
## 22     chevrolet     c1500 suburban 2wd
## 23     chevrolet     c1500 suburban 2wd
## 24     chevrolet               corvette
## 25     chevrolet               corvette
## 26     chevrolet               corvette
## 27     chevrolet               corvette
## 28     chevrolet               corvette
## 29     chevrolet        k1500 tahoe 4wd
## 30     chevrolet        k1500 tahoe 4wd
## 31     chevrolet        k1500 tahoe 4wd
## 32     chevrolet        k1500 tahoe 4wd
## 33     chevrolet                 malibu
## 34     chevrolet                 malibu
## 35     chevrolet                 malibu
## 36     chevrolet                 malibu
## 37     chevrolet                 malibu
## 38         dodge            caravan 2wd
## 39         dodge            caravan 2wd
## 40         dodge            caravan 2wd
## 41         dodge            caravan 2wd
## 42         dodge            caravan 2wd
## 43         dodge            caravan 2wd
## 44         dodge            caravan 2wd
## 45         dodge            caravan 2wd
## 46         dodge            caravan 2wd
## 47         dodge            caravan 2wd
## 48         dodge            caravan 2wd
## 49         dodge      dakota pickup 4wd
## 50         dodge      dakota pickup 4wd
```

```
## 51         dodge      dakota pickup 4wd
## 52         dodge      dakota pickup 4wd
## 53         dodge      dakota pickup 4wd
## 54         dodge      dakota pickup 4wd
## 55         dodge      dakota pickup 4wd
## 56         dodge      dakota pickup 4wd
## 57         dodge      dakota pickup 4wd
## 58         dodge            durango 4wd
## 59         dodge            durango 4wd
## 60         dodge            durango 4wd
## 61         dodge            durango 4wd
## 62         dodge            durango 4wd
## 63         dodge            durango 4wd
## 64         dodge            durango 4wd
## 65         dodge    ram 1500 pickup 4wd
## 66         dodge    ram 1500 pickup 4wd
## 67         dodge    ram 1500 pickup 4wd
## 68         dodge    ram 1500 pickup 4wd
## 69         dodge    ram 1500 pickup 4wd
## 70         dodge    ram 1500 pickup 4wd
## 71         dodge    ram 1500 pickup 4wd
## 72         dodge    ram 1500 pickup 4wd
## 73         dodge    ram 1500 pickup 4wd
## 74         dodge    ram 1500 pickup 4wd
## 75          ford         expedition 2wd
## 76          ford         expedition 2wd
## 77          ford         expedition 2wd
## 78          ford           explorer 4wd
## 79          ford           explorer 4wd
## 80          ford           explorer 4wd
## 81          ford           explorer 4wd
## 82          ford           explorer 4wd
## 83          ford           explorer 4wd
## 84          ford        f150 pickup 4wd
## 85          ford        f150 pickup 4wd
## 86          ford        f150 pickup 4wd
## 87          ford        f150 pickup 4wd
## 88          ford        f150 pickup 4wd
## 89          ford        f150 pickup 4wd
## 90          ford        f150 pickup 4wd
## 91          ford                mustang
## 92          ford                mustang
## 93          ford                mustang
## 94          ford                mustang
## 95          ford                mustang
## 96          ford                mustang
## 97          ford                mustang
## 98          ford                mustang
## 99          ford                mustang
## 100        honda                  civic
## 101        honda                  civic
## 102        honda                  civic
## 103        honda                  civic
## 104        honda                  civic
```

```
## 105        honda                 civic
## 106        honda                 civic
## 107        honda                 civic
## 108        honda                 civic
## 109      hyundai               sonata
## 110      hyundai               sonata
## 111      hyundai               sonata
## 112      hyundai               sonata
## 113      hyundai               sonata
## 114      hyundai               sonata
## 115      hyundai               sonata
## 116      hyundai              tiburon
## 117      hyundai              tiburon
## 118      hyundai              tiburon
## 119      hyundai              tiburon
## 120      hyundai              tiburon
## 121      hyundai              tiburon
## 122      hyundai              tiburon
## 123         jeep    grand cherokee 4wd
## 124         jeep    grand cherokee 4wd
## 125         jeep    grand cherokee 4wd
## 126         jeep    grand cherokee 4wd
## 127         jeep    grand cherokee 4wd
## 128         jeep    grand cherokee 4wd
## 129         jeep    grand cherokee 4wd
## 130         jeep    grand cherokee 4wd
## 131   land rover           range rover
## 132   land rover           range rover
## 133   land rover           range rover
## 134   land rover           range rover
## 135      lincoln         navigator 2wd
## 136      lincoln         navigator 2wd
## 137      lincoln         navigator 2wd
## 138      mercury       mountaineer 4wd
## 139      mercury       mountaineer 4wd
## 140      mercury       mountaineer 4wd
## 141      mercury       mountaineer 4wd
## 142       nissan                altima
## 143       nissan                altima
## 144       nissan                altima
## 145       nissan                altima
## 146       nissan                altima
## 147       nissan                altima
## 148       nissan                maxima
## 149       nissan                maxima
## 150       nissan                maxima
## 151       nissan        pathfinder 4wd
## 152       nissan        pathfinder 4wd
## 153       nissan        pathfinder 4wd
## 154       nissan        pathfinder 4wd
## 155      pontiac            grand prix
## 156      pontiac            grand prix
## 157      pontiac            grand prix
## 158      pontiac            grand prix
```

```
## 159      pontiac             grand prix
## 160       subaru           forester awd
## 161       subaru           forester awd
## 162       subaru           forester awd
## 163       subaru           forester awd
## 164       subaru           forester awd
## 165       subaru           forester awd
## 166       subaru            impreza awd
## 167       subaru            impreza awd
## 168       subaru            impreza awd
## 169       subaru            impreza awd
## 170       subaru            impreza awd
## 171       subaru            impreza awd
## 172       subaru            impreza awd
## 173       subaru            impreza awd
## 174       toyota            4runner 4wd
## 175       toyota            4runner 4wd
## 176       toyota            4runner 4wd
## 177       toyota            4runner 4wd
## 178       toyota            4runner 4wd
## 179       toyota            4runner 4wd
## 180       toyota                  camry
## 181       toyota                  camry
## 182       toyota                  camry
## 183       toyota                  camry
## 184       toyota                  camry
## 185       toyota                  camry
## 186       toyota                  camry
## 187       toyota           camry solara
## 188       toyota           camry solara
## 189       toyota           camry solara
## 190       toyota           camry solara
## 191       toyota           camry solara
## 192       toyota           camry solara
## 193       toyota           camry solara
## 194       toyota                corolla
## 195       toyota                corolla
## 196       toyota                corolla
## 197       toyota                corolla
## 198       toyota                corolla
## 199       toyota land cruiser wagon 4wd
## 200       toyota land cruiser wagon 4wd
## 201       toyota      toyota tacoma 4wd
## 202       toyota      toyota tacoma 4wd
## 203       toyota      toyota tacoma 4wd
## 204       toyota      toyota tacoma 4wd
## 205       toyota      toyota tacoma 4wd
## 206       toyota      toyota tacoma 4wd
## 207       toyota      toyota tacoma 4wd
## 208   volkswagen                   gti
## 209   volkswagen                   gti
## 210   volkswagen                   gti
## 211   volkswagen                   gti
## 212   volkswagen                   gti
```

```
## 213   volkswagen                 jetta
## 214   volkswagen                 jetta
## 215   volkswagen                 jetta
## 216   volkswagen                 jetta
## 217   volkswagen                 jetta
## 218   volkswagen                 jetta
## 219   volkswagen                 jetta
## 220   volkswagen                 jetta
## 221   volkswagen                 jetta
## 222   volkswagen            new beetle
## 223   volkswagen            new beetle
## 224   volkswagen            new beetle
## 225   volkswagen            new beetle
## 226   volkswagen            new beetle
## 227   volkswagen            new beetle
## 228   volkswagen                passat
## 229   volkswagen                passat
## 230   volkswagen                passat
## 231   volkswagen                passat
## 232   volkswagen                passat
## 233   volkswagen                passat
## 234   volkswagen                passat
```

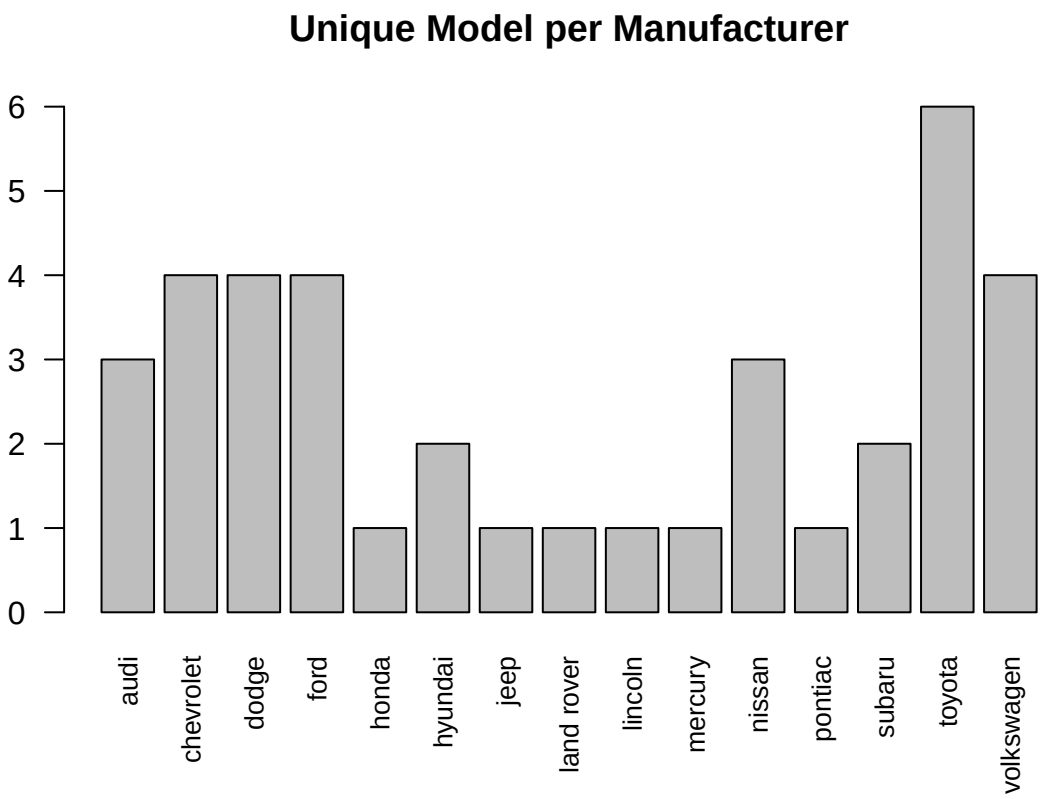
```
unique_mods <- unique(manufacturers_models)
unique_mods
```

```
##     Manufacturer                 Model
## 1           audi                    a4
## 8           audi             a4 quattro
## 16          audi             a6 quattro
## 19     chevrolet     c1500 suburban 2wd
## 24     chevrolet              corvette
## 29     chevrolet        k1500 tahoe 4wd
## 33     chevrolet                malibu
## 38         dodge            caravan 2wd
## 49         dodge      dakota pickup 4wd
## 58         dodge            durango 4wd
## 65         dodge    ram 1500 pickup 4wd
## 75          ford         expedition 2wd
## 78          ford           explorer 4wd
## 84          ford        f150 pickup 4wd
## 91          ford                mustang
## 100        honda                  civic
## 109      hyundai                sonata
## 116      hyundai               tiburon
## 123         jeep     grand cherokee 4wd
## 131   land rover           range rover
## 135      lincoln          navigator 2wd
## 138      mercury        mountaineer 4wd
## 142       nissan                altima
## 148       nissan                maxima
## 151       nissan         pathfinder 4wd
## 155      pontiac             grand prix
## 160       subaru           forester awd
## 166       subaru            impreza awd
```

```
## 174       toyota            4runner 4wd
## 180       toyota                camry
## 187       toyota           camry solara
## 194       toyota               corolla
## 199       toyota land cruiser wagon 4wd
## 201       toyota      toyota tacoma 4wd
## 208   volkswagen                  gti
## 213   volkswagen                jetta
## 222   volkswagen            new beetle
## 228   volkswagen                passat
```

2.b Graph the result by using plot() and ggplot(). Write the codes and its result

```
#install.packages("ggplot2")
library(ggplot2)

factoredManufacturer <- as.factor(unique_mods$Manufacturer)
manufacturerPlot <- plot(as.factor(factoredManufacturer),
                 main = "Unique Model per Manufacturer",
                 cex.names = 0.8, las = 2)
```




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

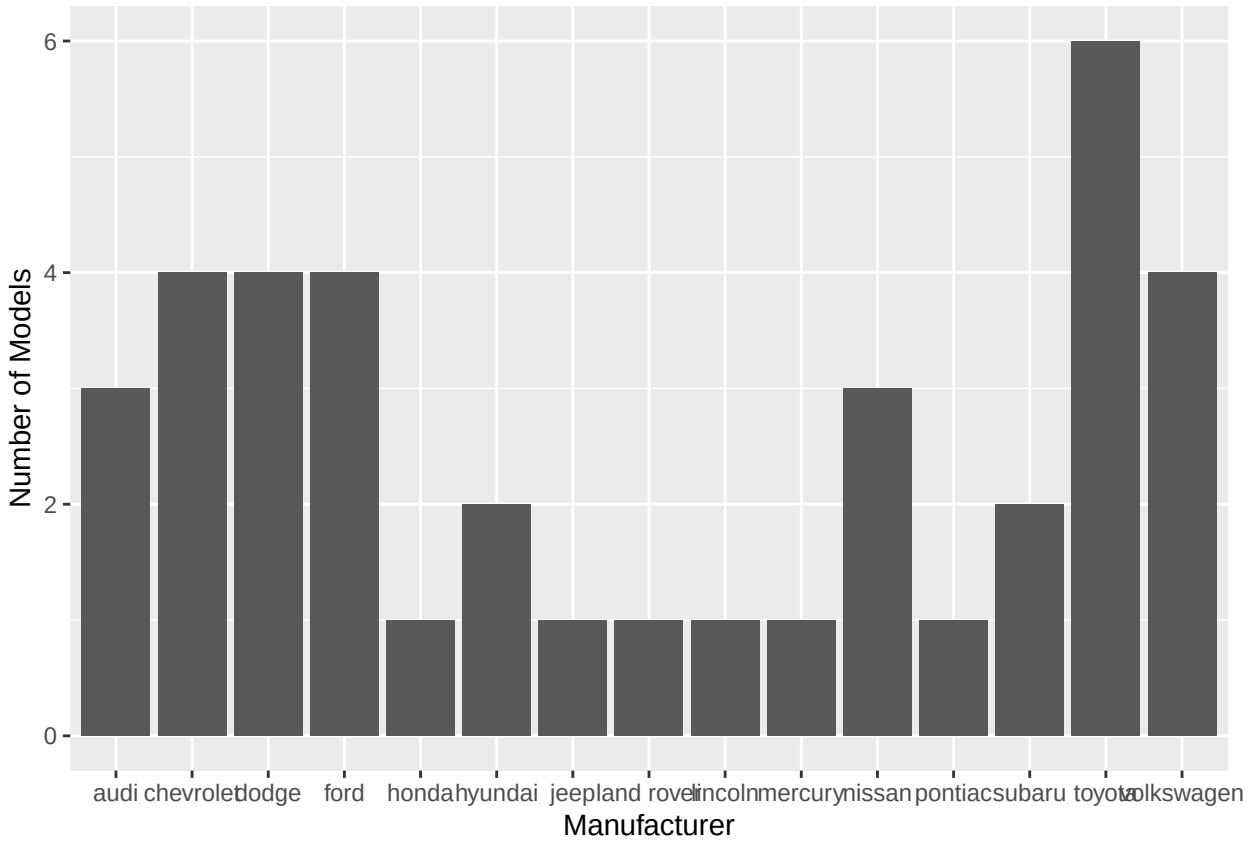
```
unique_count <- unique_mods %>%
  count(unique_mods$Manufacturer)
unique_count
```

```
##    unique_mods$Manufacturer n
## 1                      audi 3
## 2                 chevrolet 4
## 3                     dodge 4
## 4                      ford 4
## 5                     honda 1
## 6                   hyundai 2
## 7                      jeep 1
## 8                land rover 1
## 9                   lincoln 1
## 10                  mercury 1
## 11                   nissan 3
## 12                  pontiac 1
## 13                   subaru 2
## 14                   toyota 6
## 15               volkswagen 4
```

```
names(unique_count) <- c("Manufacturer", "Number of Models")
unique_count
```

```
##    Manufacturer Number of Models
## 1          audi                3
## 2     chevrolet                4
## 3         dodge                4
## 4          ford                4
## 5         honda                1
## 6       hyundai                2
## 7          jeep                1
## 8    land rover                1
## 9       lincoln                1
## 10      mercury                1
## 11       nissan                3
## 12      pontiac                1
## 13       subaru                2
## 14       toyota                6
## 15   volkswagen                4
```

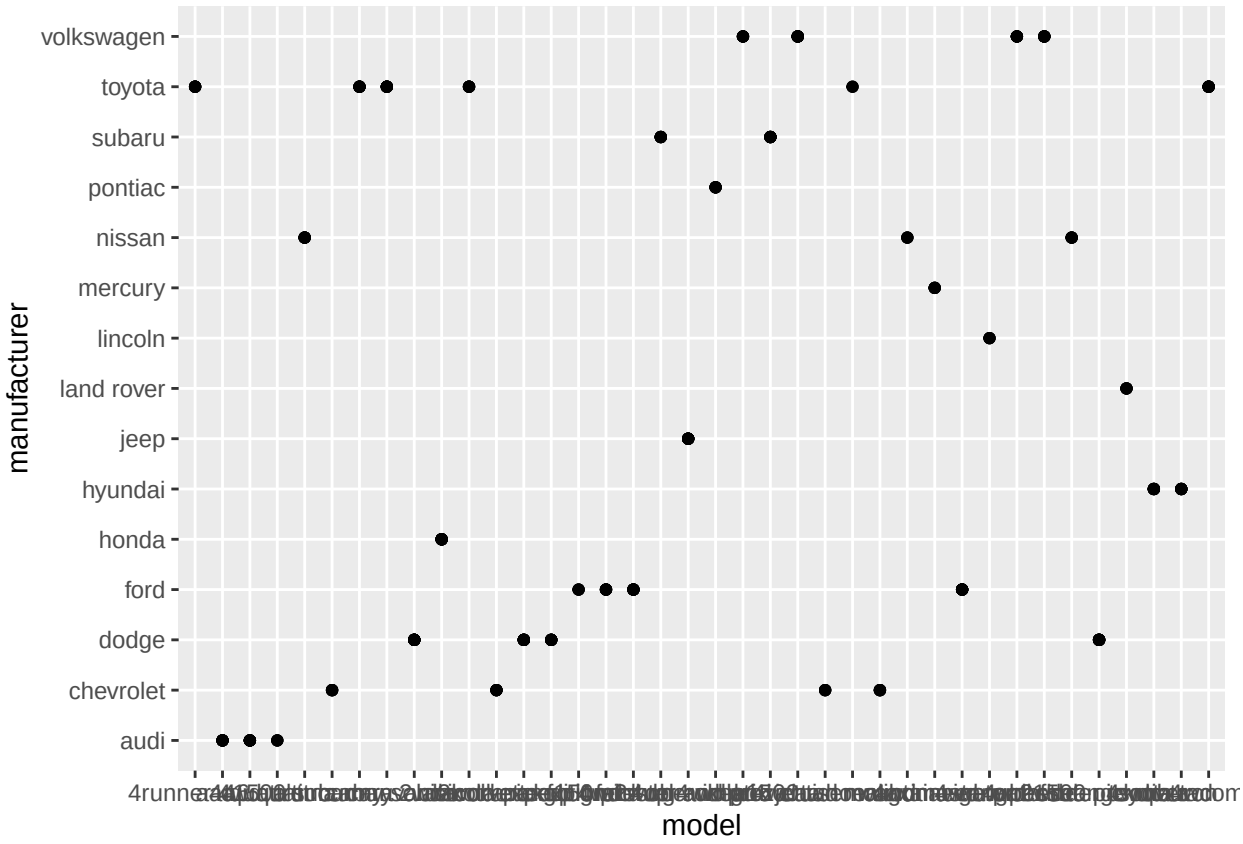
```
ggplot(unique_count, aes(x = Manufacturer, y = `Number of Models`)) +
geom_bar(stat = "identity")
```




2. Same dataset will be used. You are going to show the relationship of the modeland the manufacturer.

2a. What does ggplot(mpg, aes(model, manufacturer)) + geom_point() show?

```
#This plot will display points representing the relationship between car models and their respective ma
ggplot(mpg_file, aes(model, manufacturer)) + geom_point()
```

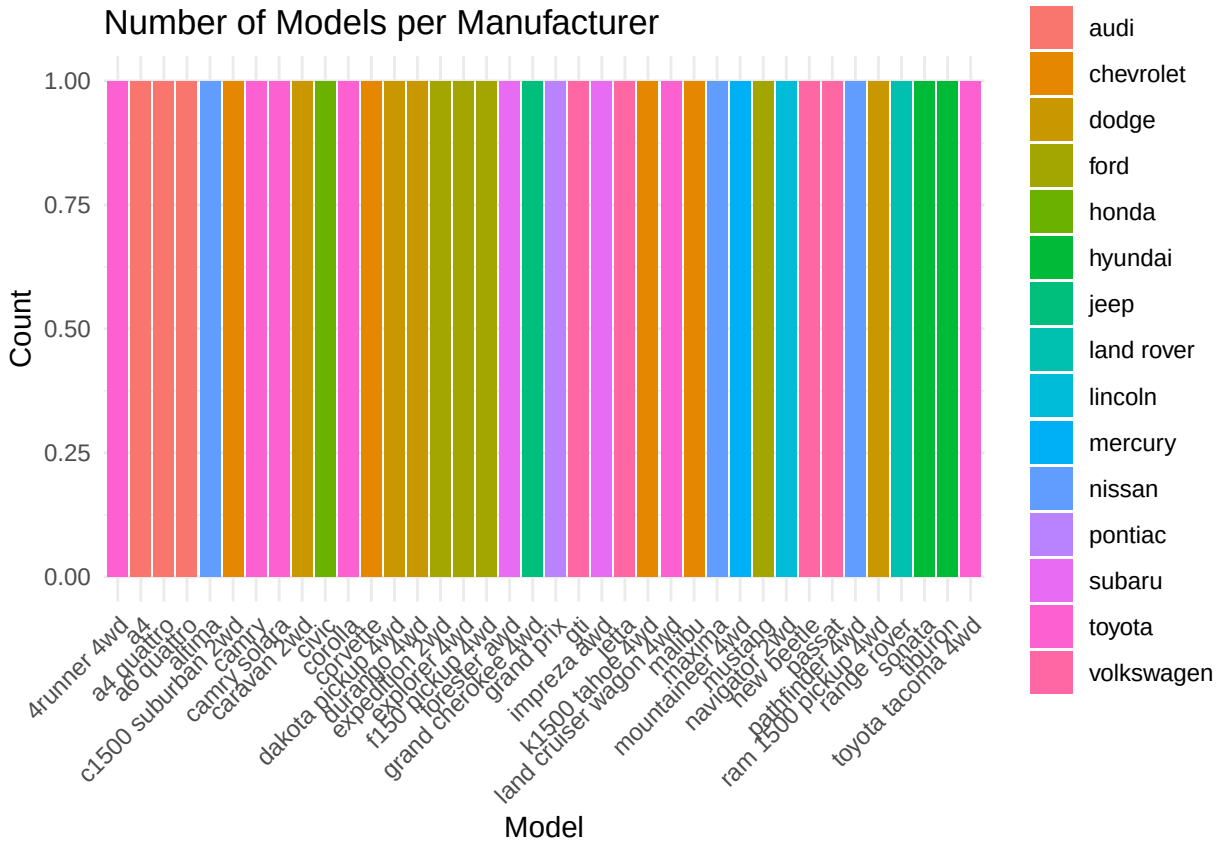



2b. For you, is it useful? If not, how could you modify the data to make it more informative?

```
#This visualization might not be very useful if there are many models or manufacturers, as the #points
library(ggplot2)

model_manufacturer_count <- mpg %>%
  group_by(model, manufacturer) %>%
  summarise(count = n())
```

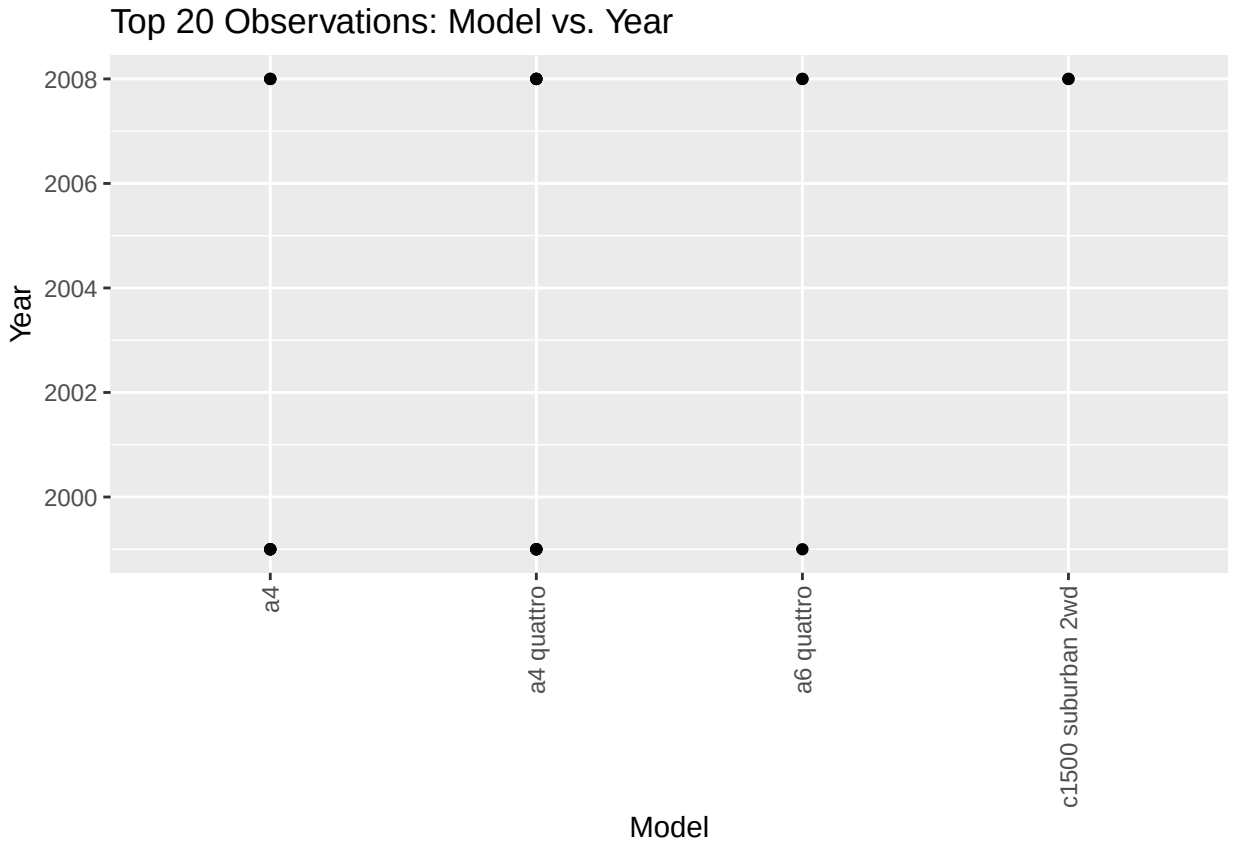
```
## `summarise()` has grouped output by 'model'. You can override using the
## `.groups` argument.
```

```
ggplot(model_manufacturer_count, aes(x = model, fill = manufacturer)) +
  geom_bar() +
  labs(title = "Number of Models per Manufacturer",
       x = "Model", y = "Count",
       fill = "Manufacturer") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```




3.Plot the model and the year using ggplot(). Use only the top 20 observations. Write the codes and its results.

```
library(ggplot2)


top_20 <- head(mpg_file, 20)


ggplot(top_20, aes(x = model, y = year)) +
  geom_point() +
  labs(title = "Top 20 Observations: Model vs. Year", x = "Model", y = "Year") +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust = 1))
```

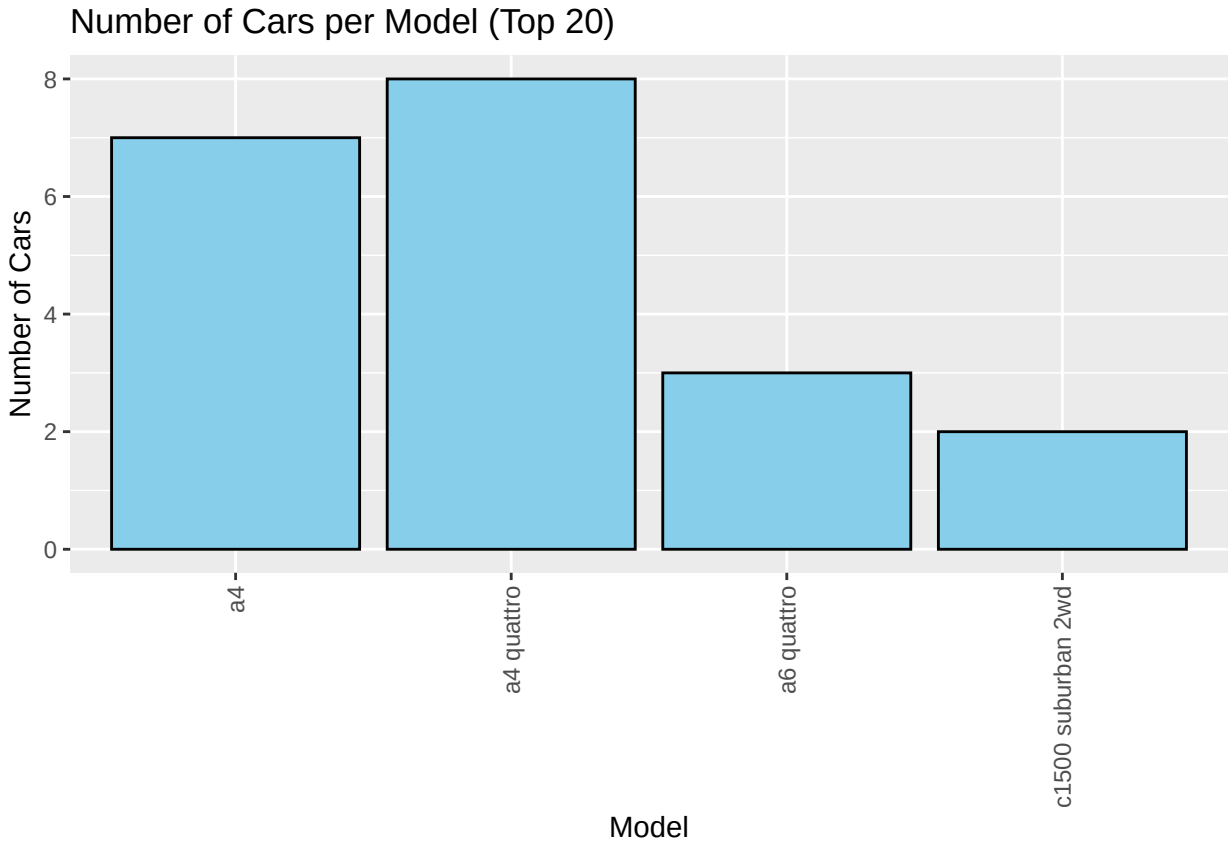



4.Using the pipe (%>%), group the model and get the number of cars per model. Show codes and its result.

```
library(dplyr)


cars_per_model <- mpg_file %>%
count(model)
```

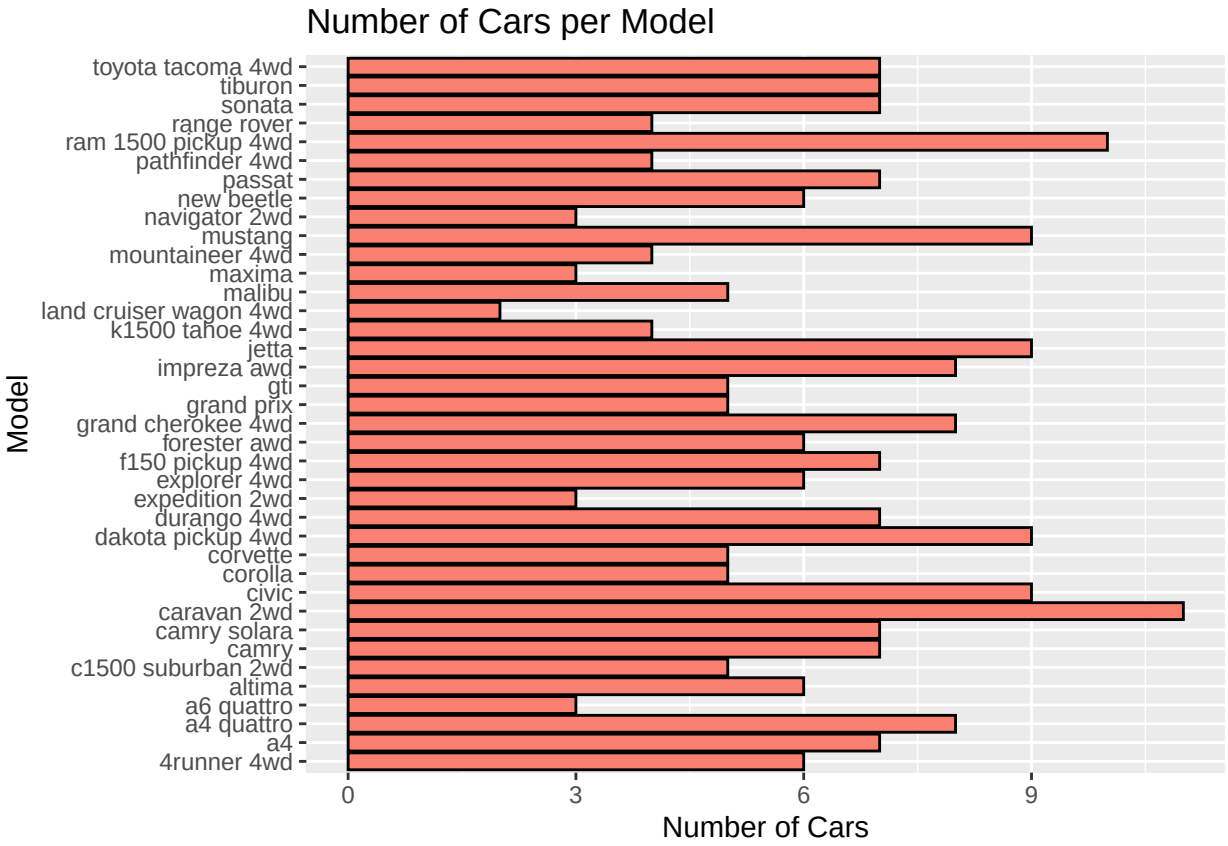
4a. Plot using geom_bar() using the top 20 observations only. The graphs shoudl have a title, labels and colors. Show code and results.

```
library(ggplot2)

# Extracting the top 20 observations
top_20 <- head(mpg_file, 20)


ggplot(top_20, aes(x = model)) +
  geom_bar(fill = "skyblue", color = "black") +
  labs(title = "Number of Cars per Model (Top 20)", x = "Model", y = "Number of Cars") +
  theme(axis.text.x = element_text(angle = 90, vjust = 0.5, hjust = 1))
```



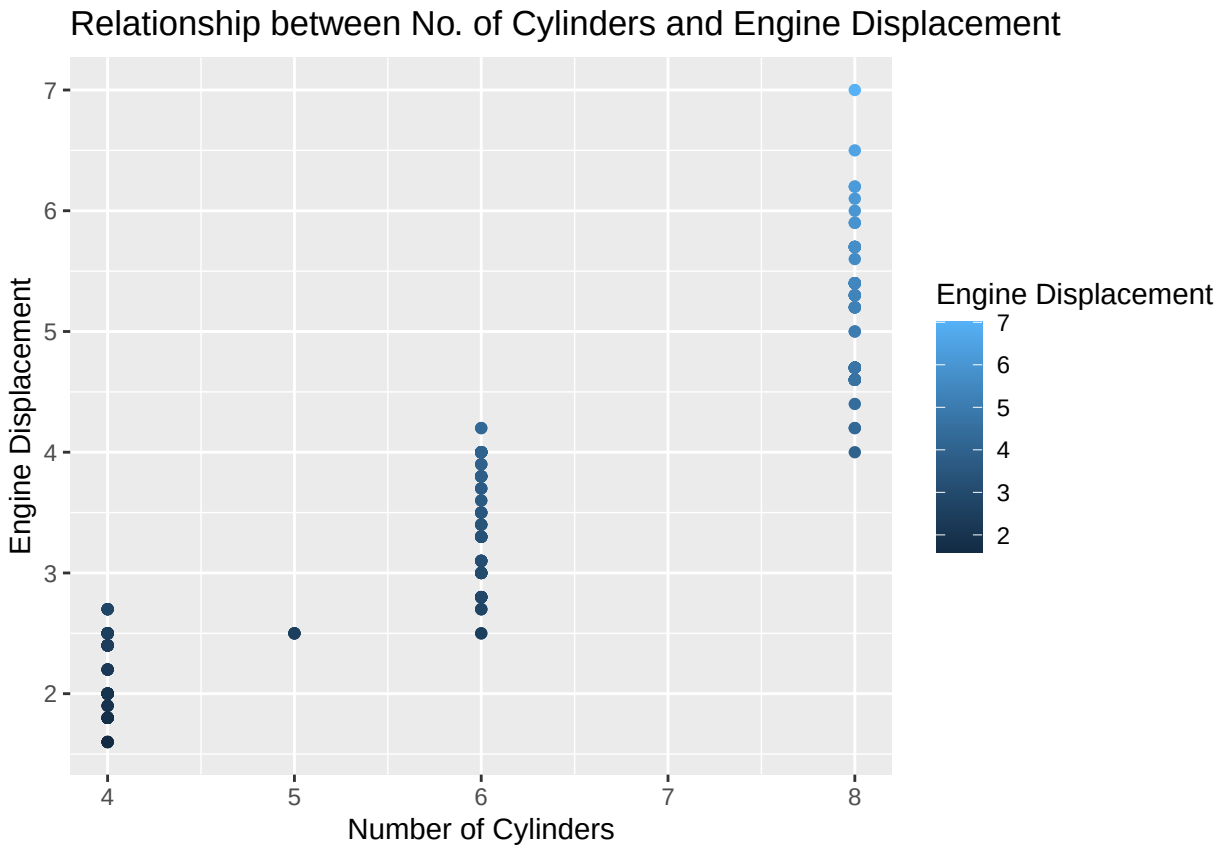

4b. Plot using the geom_bar() + coord_flip() just like what is shown below. Show codes and its result.

```
ggplot(cars_per_model, aes(x = model, y = n)) +
  geom_bar(stat = "identity", fill = "salmon", color = "black") +
  labs(title = "Number of Cars per Model", x = "Model", y = "Number of Cars") +
  coord_flip()
```




5.Plot the relationship between cyl - number of cylinders and displ - engine displacement using geom_point with aesthetic color = engine displacement. Title should be "Relationship between No. of Cylinders and Engine Displacement". a. How would you describe its relationship? Show the codes and its result.

```
library(ggplot2)

# Plotting relationship between cyl and displ with color mapped to displ
ggplot(mpg_file, aes(x = cyl, y = displ, color = displ)) +
  geom_point() +
  labs(title = "Relationship between No. of Cylinders and Engine Displacement",
       x = "Number of Cylinders", y = "Engine Displacement") +
  scale_color_continuous(name = "Engine Displacement")  # Adding a color legend
```




6.Import the traffic.csv onto your R

```
library(readr)
traffic <- read_csv("traffic.csv")
```

```
## Rows: 48120 Columns: 4
## -- Column specification --------------------------------------------------------
## Delimiter: ","
## dbl  (3): Junction, Vehicles, ID
## dttm (1): DateTime
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
traffic
```

```
## # A tibble: 48,120 x 4
##    DateTime            Junction Vehicles          ID
##    <dttm>                 <dbl>    <dbl>       <dbl>
##  1 2015-11-01 00:00:00        1       15 20151101001
##  2 2015-11-01 01:00:00        1       13 20151101011
##  3 2015-11-01 02:00:00        1       10 20151101021
##  4 2015-11-01 03:00:00        1        7 20151101031
##  5 2015-11-01 04:00:00        1        9 20151101041
##  6 2015-11-01 05:00:00        1        6 20151101051
##  7 2015-11-01 06:00:00        1        9 20151101061
##  8 2015-11-01 07:00:00        1        8 20151101071
##  9 2015-11-01 08:00:00        1       11 20151101081
## 10 2015-11-01 09:00:00        1       12 20151101091
```

```
## # i 48,110 more rows
```

6a. How many numbers of observation does it have? What are the variables of the traffic dataset the Show your answer.

```
num_observations <- nrow(traffic)

num_variables <- ncol(traffic)


print(paste("Number of observations:", num_observations))
```

```
## [1] "Number of observations: 48120"
```

```
print(paste("Number of variables:", num_variables))
```

```
## [1] "Number of variables: 4"
```

```
names(traffic)
```

```
## [1] "DateTime" "Junction" "Vehicles" "ID"
```

6b. subset the traffic dataset into junctions. What is the R codes and its output?

```
unique_junctions <- unique(traffic$junctions)
```

```
## Warning: Unknown or uninitialised column: `junctions`.
```

```
junction_data <- lapply(unique_junctions, function(junction) {
  subset_data <- subset(traffic, junctions == junction)
  return(subset_data)
})

junction_data
```

```
## list()
```

6c. Plot each junction in a using geom_line(). Show your solution and output.

```
library(ggplot2)


plot_list <- lapply(junction_data, function(junction) {
  ggplot(junction, aes(x = time, y = traffic_volume)) + geom_line() + ggtitle("Traffic Volume")
})


plot_list
```

```
## list()
```

7. From alexa_file.xlsx, import it to your environment

```
library(readxl)
alexa_file <- read_xlsx("alexa_file.xlsx")
alexa_file
```

```
## # A tibble: 3,150 x 5
##    rating date                variation          verified_reviews      feedback
##     <dbl> <dttm>              <chr>              <chr>                    <dbl>
##  1      5 2018-07-31 00:00:00 Charcoal Fabric    Love my Echo!                1
```

```
##  2      5 2018-07-31 00:00:00 Charcoal Fabric     Loved it!                   1
##  3      4 2018-07-31 00:00:00 Walnut Finish       Sometimes while play~       1
##  4      5 2018-07-31 00:00:00 Charcoal Fabric     I have had a lot of ~       1
##  5      5 2018-07-31 00:00:00 Charcoal Fabric     Music                       1
##  6      5 2018-07-31 00:00:00 Heather Gray Fabric I received the echo ~       1
##  7      3 2018-07-31 00:00:00 Sandstone Fabric    Without having a cel~       1
##  8      5 2018-07-31 00:00:00 Charcoal Fabric     I think this is the ~       1
##  9      5 2018-07-30 00:00:00 Heather Gray Fabric looks great                 1
## 10      5 2018-07-30 00:00:00 Heather Gray Fabric Love it! I've listen~       1
## # i 3,140 more rows
```

a. How many observations does alexa_file has? What about the number of columns? Show your solution and answer.

```
nrow(alexa_file)
```

```
## [1] 3150
```

```
ncol(alexa_file)
```

```
## [1] 5
```

7b. group the variations and get the total of each variations. Use dplyr package. Show solution and answer.

```
library(dplyr)

variation_totals <- alexa_file %>%
  group_by(variation) %>%
  summarise(total = n())

variation_totals
```

```
## # A tibble: 16 x 2
##    variation                    total
##    <chr>                        <int>
##  1 Black                          261
##  2 Black  Dot                     516
##  3 Black  Plus                    270
##  4 Black  Show                    265
##  5 Black  Spot                    241
##  6 Charcoal Fabric                430
##  7 Configuration: Fire TV Stick   350
##  8 Heather Gray Fabric            157
##  9 Oak Finish                      14
## 10 Sandstone Fabric                90
## 11 Walnut Finish                    9
## 12 White                           91
## 13 White  Dot                     184
## 14 White  Plus                     78
## 15 White  Show                     85
## 16 White  Spot                    109
```

7c. Plot the variations using the ggplot() function. What did you observe? Complete the details of the graph. Show solution and answer.

```
library(ggplot2)

ggplot(alexa_file, aes(x = variation)) +
```

```
  geom_bar() +
  labs(title = "Distribution of Alexa Variations",
       x = "Variation",
       y = "Count") +
  theme_minimal()
```