WORKSHEET #6

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2022-12-21

1.How many columns are in mpg dataset? How about the number of rows? Show the codes and its result.

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 4.2.2
```

```
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 4.2.2
```

```
##
## 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
```

```
data(mpg)
nrow(mpg)
```

```
## [1] 234
```

```
ncol(mpg)
```

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

There are 11 columns and 234 rows in mpg data set.

2. Which manufacturer has the most models in this data set? Which model has the most variations? Ans:

```
manu_mpg <- mpg$manufacturer
table(manu_mpg)
```

```
## manu_mpg
##       audi  chevrolet      dodge       ford      honda    hyundai       jeep 
##         18         19         37         25          9         14          8 
## land rover    lincoln    mercury     nissan    pontiac     subaru     toyota 
##          4          3          4         13          5         14         34 
## volkswagen 
##         27
```

Dodge has the most models and variations in this data set.

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

```
group_data1 <- mpg

unique_mod <- group_data1 %>% group_by(manufacturer, model) %>%
  distinct() %>% count()
unique_mod
```

```
## # A tibble: 38 x 3
## # Groups:   manufacturer, model [38]
##    manufacturer model                  n
##    <chr>        <chr>              <int>
##  1 audi         a4                     7
##  2 audi         a4 quattro             8
##  3 audi         a6 quattro             3
##  4 chevrolet    c1500 suburban 2wd     4
##  5 chevrolet    corvette               5
##  6 chevrolet    k1500 tahoe 4wd        4
##  7 chevrolet    malibu                 5
##  8 dodge        caravan 2wd            9
##  9 dodge        dakota pickup 4wd      8
## 10 dodge        durango 4wd            6
## # ... with 28 more rows
```

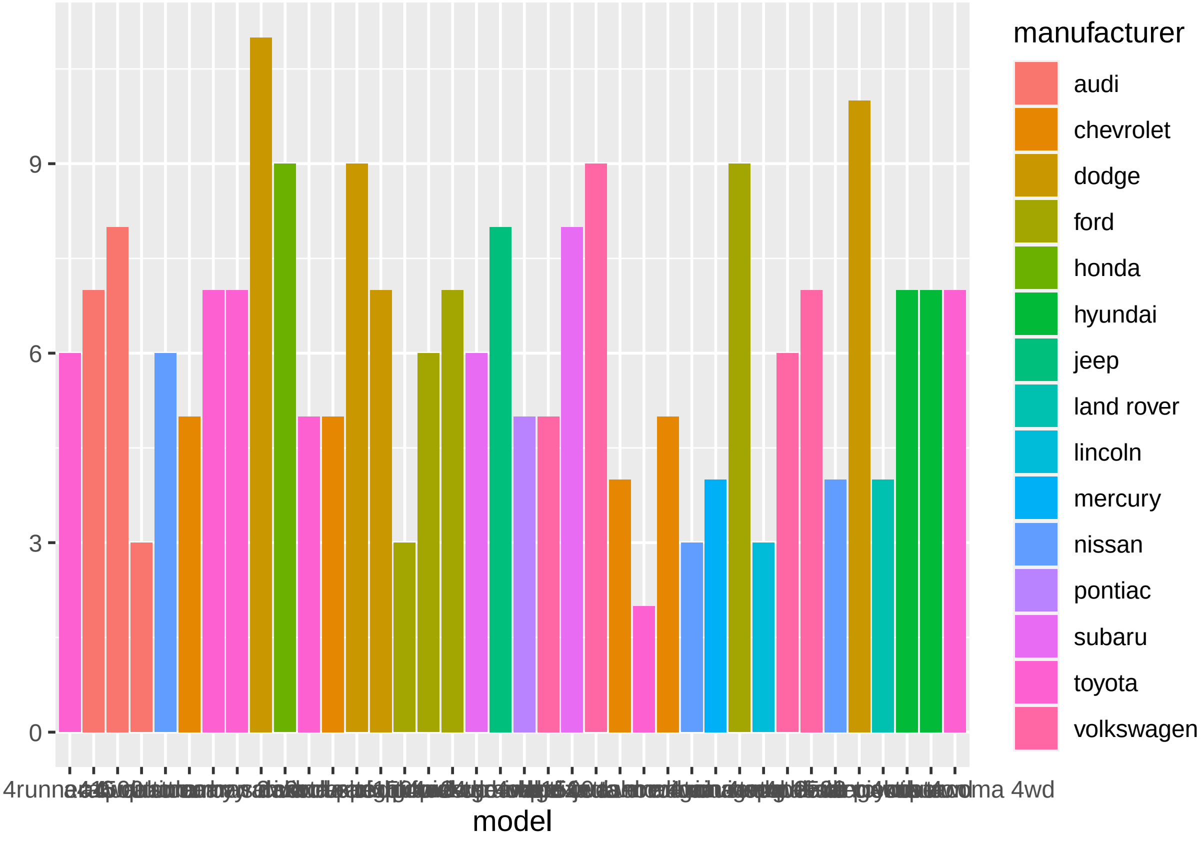
```
colnames(unique_mod) <- c("Manufacturer", "Model", "Counts")
unique_mod
```

```
## # A tibble: 38 x 3
## # Groups:   Manufacturer, Model [38]
##    Manufacturer Model              Counts
##    <chr>        <chr>               <int>
##  1 audi         a4                      7
##  2 audi         a4 quattro              8
##  3 audi         a6 quattro              3
##  4 chevrolet    c1500 suburban 2wd      4
##  5 chevrolet    corvette                5
##  6 chevrolet    k1500 tahoe 4wd         4
##  7 chevrolet    malibu                  5
##  8 dodge        caravan 2wd             9
##  9 dodge        dakota pickup 4wd       8
## 10 dodge        durango 4wd             6
## # ... with 28 more rows
```

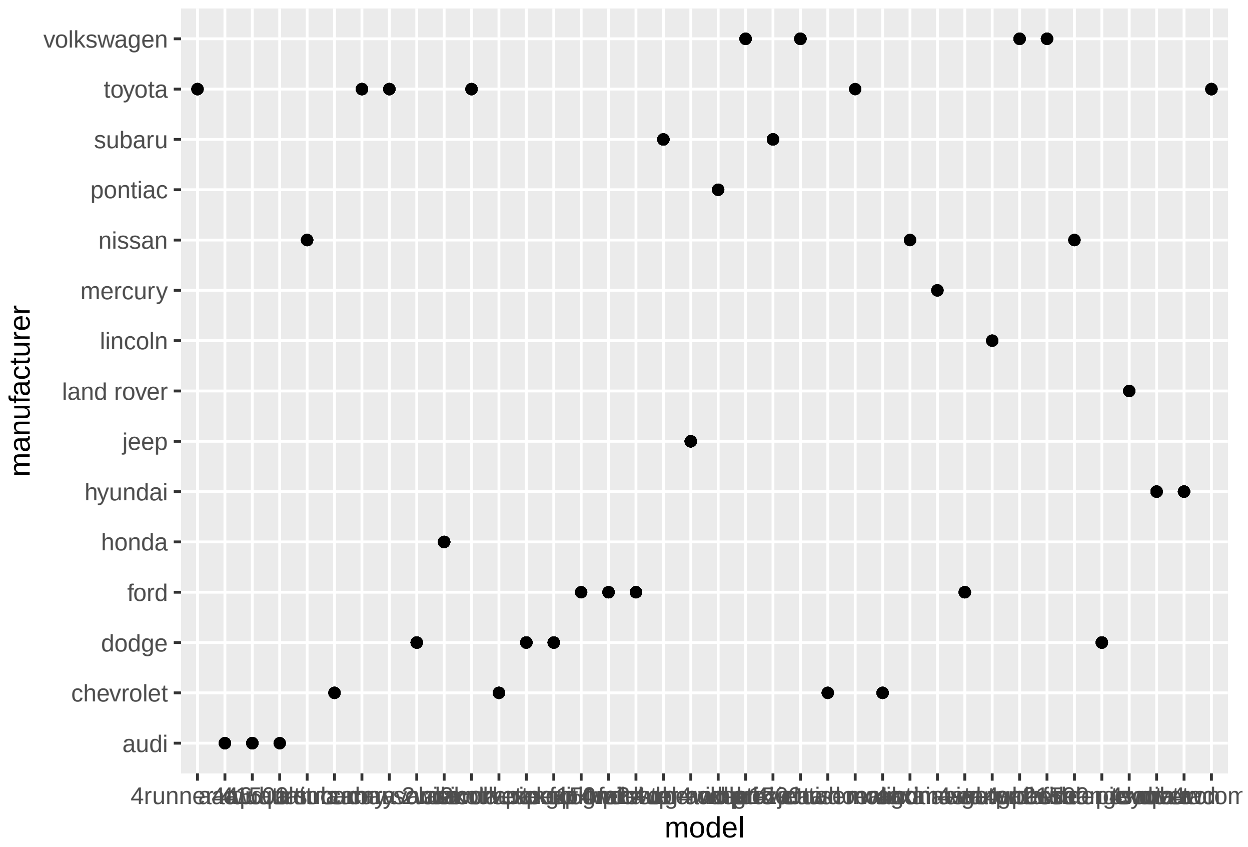
2.b Graph the result by using plot() and ggplot(). Write the codes and its result.

```
qplot(model, data = mpg,geom = "bar", fill=manufacturer)
```

```
## Warning: ‘qplot()‘ was deprecated in ggplot2 3.4.0.
```



```
ggplot(mpg, aes(model, manufacturer)) + geom_point()
```



3. Same dataset will be used. You are going to show the relationship of the model and the manufacturer.

```
rs_data <- mpg
models <- rs_data %>% group_by(manufacturer, model) %>%
  distinct() %>% count()
models
```

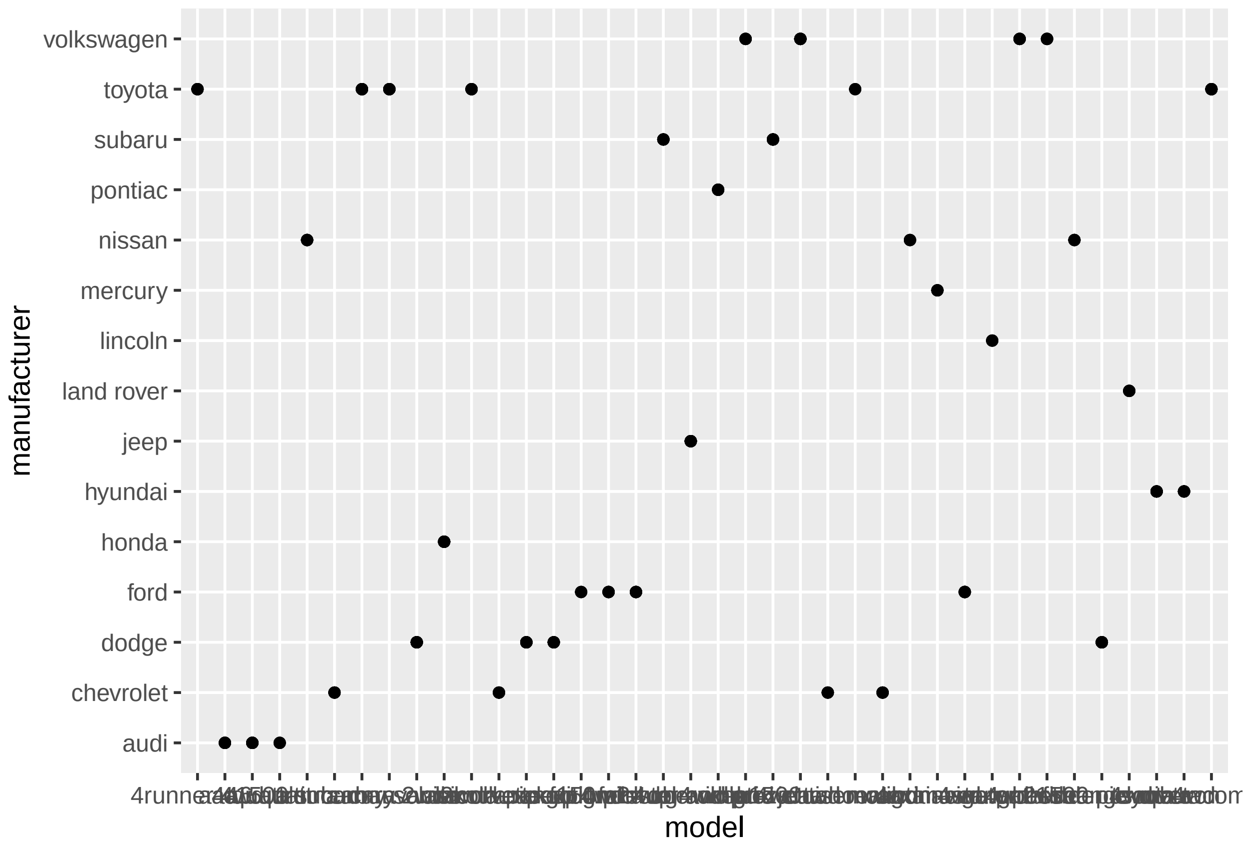
```
## # A tibble: 38 x 3
## # Groups:   manufacturer, model [38]
##    manufacturer model                  n
##    <chr>        <chr>              <int>
##  1 audi         a4                     7
##  2 audi         a4 quattro             8
##  3 audi         a6 quattro             3
##  4 chevrolet    c1500 suburban 2wd     4
##  5 chevrolet    corvette               5
##  6 chevrolet    k1500 tahoe 4wd        4
##  7 chevrolet    malibu                 5
##  8 dodge        caravan 2wd            9
##  9 dodge        dakota pickup 4wd      8
## 10 dodge        durango 4wd            6
## # ... with 28 more rows
```

```r
colnames(models) <- c("Manufacturer", "Model", "Counts")
models
```

```
## # A tibble: 38 x 3
## # Groups:   Manufacturer, Model [38]
##    Manufacturer Model               Counts
##    <chr>        <chr>                <int>
##  1 audi         a4                       7
##  2 audi         a4 quattro               8
##  3 audi         a6 quattro               3
##  4 chevrolet    c1500 suburban 2wd       4
##  5 chevrolet    corvette                 5
##  6 chevrolet    k1500 tahoe 4wd          4
##  7 chevrolet    malibu                   5
##  8 dodge        caravan 2wd              9
##  9 dodge        dakota pickup 4wd        8
## 10 dodge        durango 4wd              6
## # ... with 28 more rows
```

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

```r
ggplot(mpg, aes(model, manufacturer)) + geom_point()
```



This code shows a geometric point graph of model and manufacturer of the mpg data set.

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

This plot is useful since it efficiently creates a data visualization for us to have an easy access.

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

```
rs_data2 <- models %>% group_by(Model) %>% count()
colnames(rs_data2) <- c("Model","Counts")
rs_data2
```

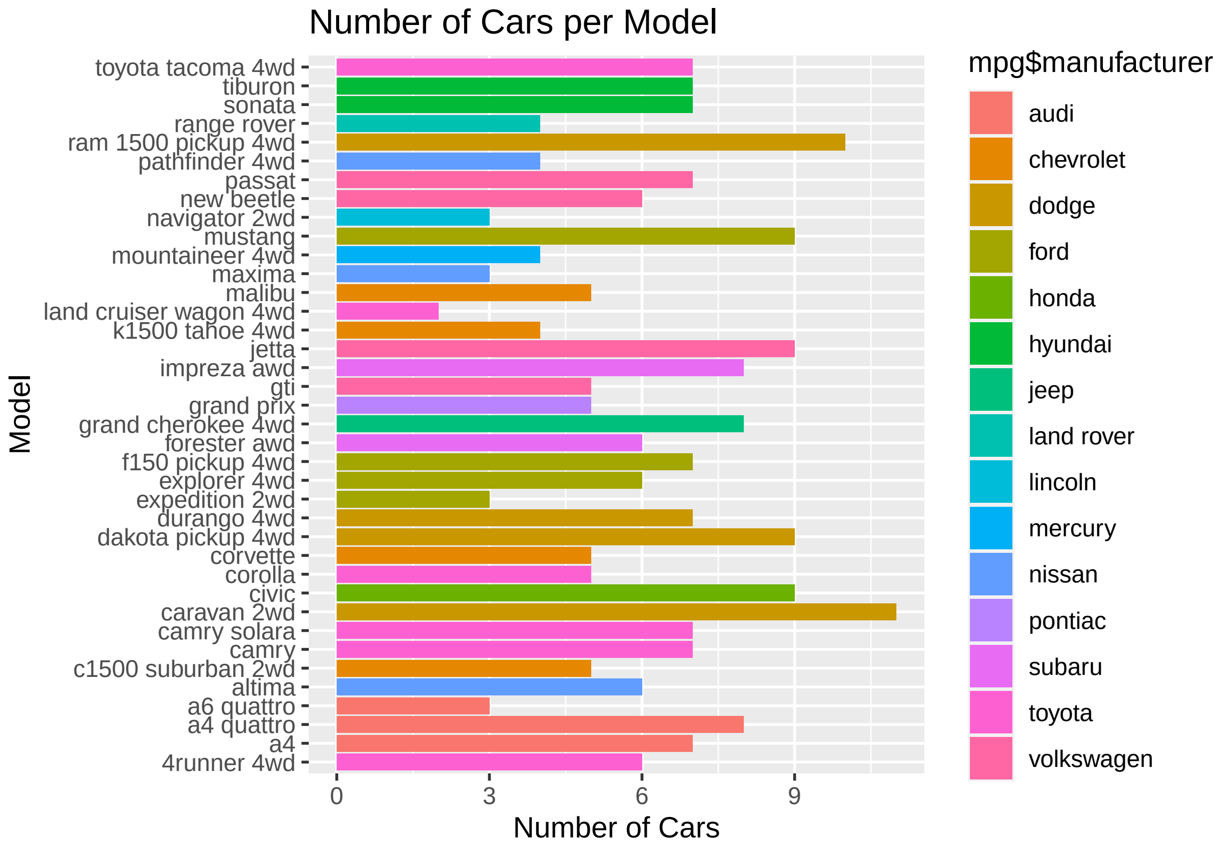
```
## # A tibble: 38 x 2
## # Groups:   Model [38]
##    Model              Counts
##    <chr>               <int>
##  1 4runner 4wd             1
##  2 a4                      1
##  3 a4 quattro              1
##  4 a6 quattro              1
##  5 altima                  1
##  6 c1500 suburban 2wd      1
##  7 camry                   1
##  8 camry solara            1
##  9 caravan 2wd             1
## 10 civic                   1
## # ... with 28 more rows
```

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

```
qplot(mpg$model, data = mpg,
      main = "Number of Cars per Model",
      xlab = "Model", ylab = "Number of Cars",
      geom = "bar", fill = mpg$manufacturer) + coord_flip()
```

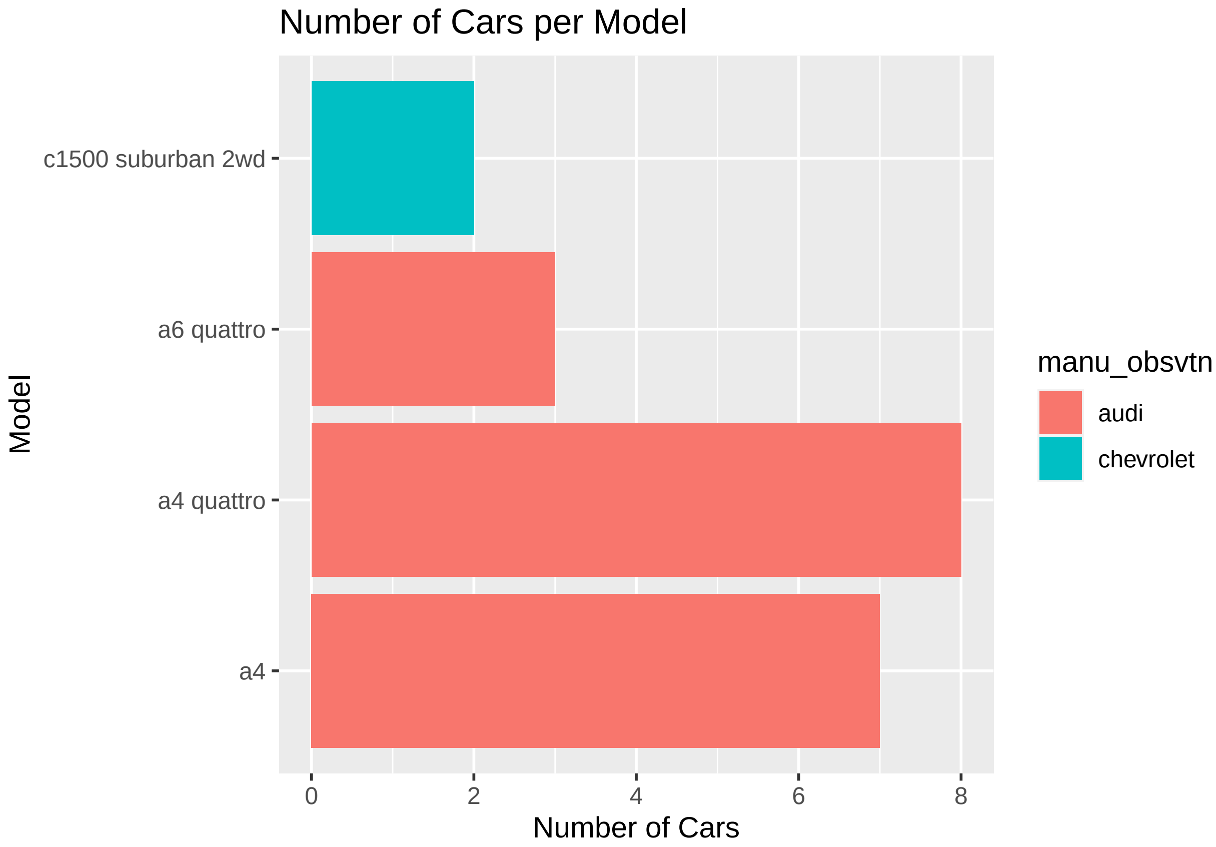
```
## Warning: Use of ‘mpg$model‘ is discouraged.
## i Use ‘model‘ instead.
```

```
## Warning: Use of ‘mpg$manufacturer‘ is discouraged.
## i Use ‘manufacturer‘ instead.
```



4.b Use only the top 20 observations. Show code and results.

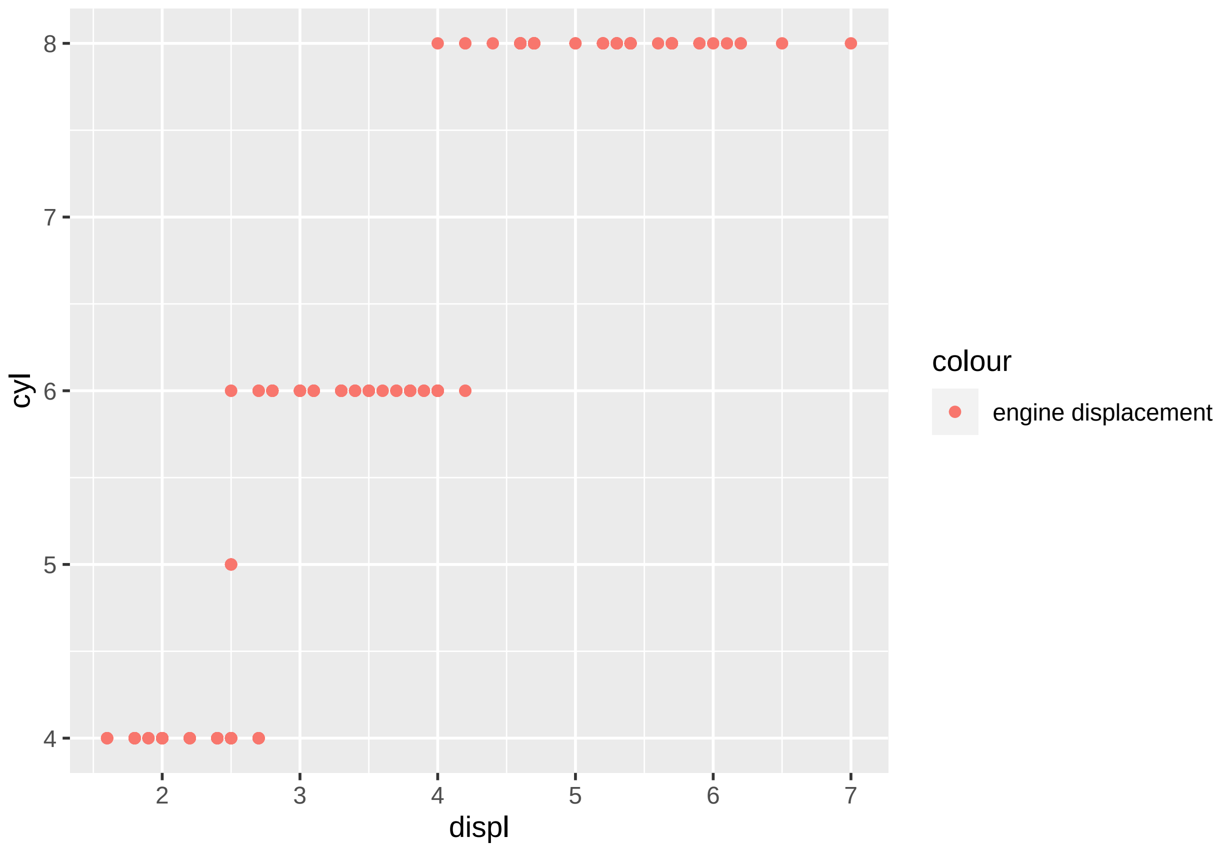
```
data_obsvtn <- subset(mpg[c(1:20),c(1:11)])
manu_obsvtn <- mpg$manufacturer[1:20]
model_obsvtn <- mpg$model[1:20]

qplot(model_obsvtn, data = data_obsvtn, main = "Number of Cars per Model",
      xlab = "Model",ylab = "Number of Cars", geom = "bar", fill = manu_obsvtn) + coord_flip()
```



5. Plot the relationship between cyl - number of cylinders and displ - engine displace-ment using geom_point with aesthetic colour = engine displacement. Title should be “Relationship between No. of Cylinders and Engine Displacement”.

5.a Show the codes and its result.

```
ggplot(data = mpg,
       mapping = aes(x = displ,
                    y = cyl,
                    main = "Relationship between No. of Cylinders and Engine Displacement")) +
  geom_point(mapping=aes(colour = "engine displacement"))
```



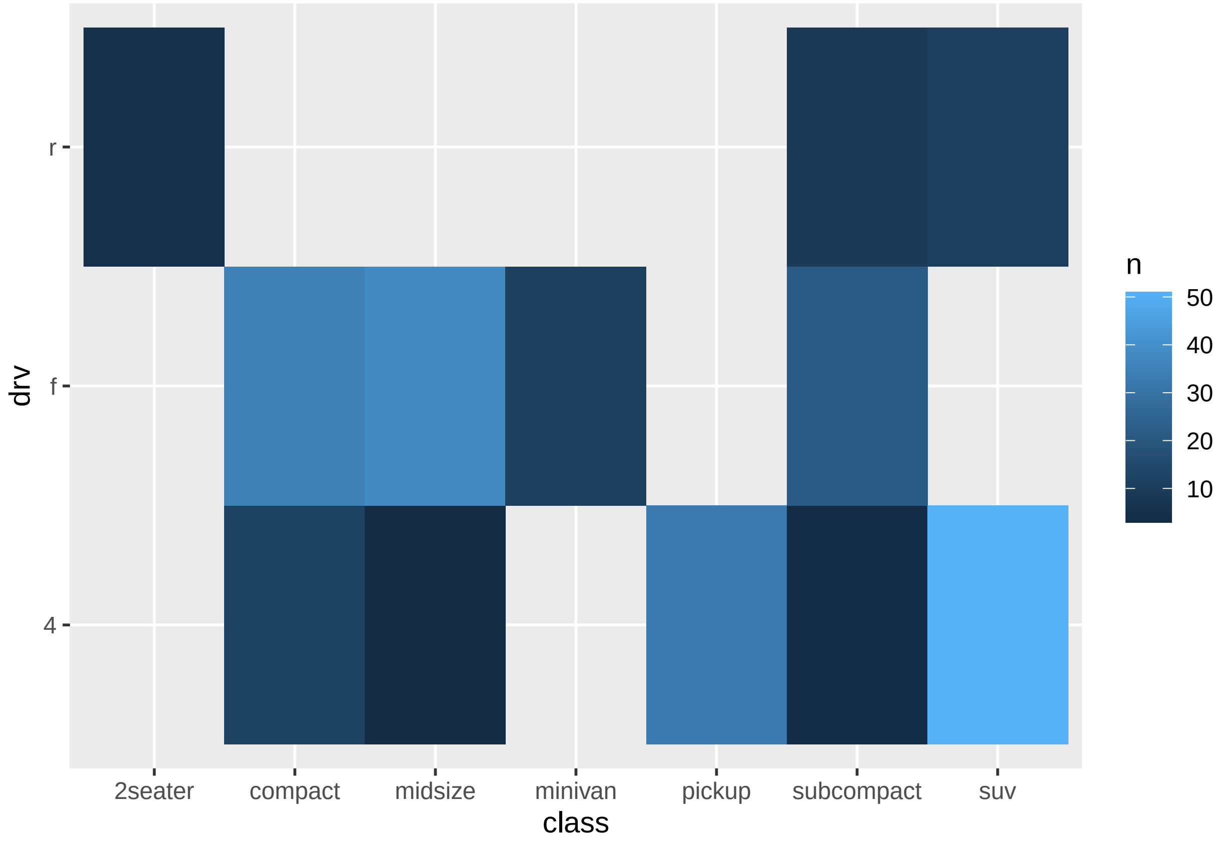
5.b How would u describe its relationships?

The engine displacement for a car is higher for higher number of cylinders. In other words, as the displ increases, the number of cylinders also increases.

6. Get the total number of observations for drv - type of drive train (f = front-wheel drive, r = rear wheel drive, 4 = 4wd) and class - type of class (Example: suv, 2seater, etc.) Plot using the geom_tile() where the number of observations for class be used as a fill for aesthetics.

6.a Show the codes and its result for the narrative in #6.

```
mpg %>%
  count(class, drv) %>%
  ggplot(aes(x = class, y = drv)) +
    geom_tile(mapping = aes(fill = n))
```

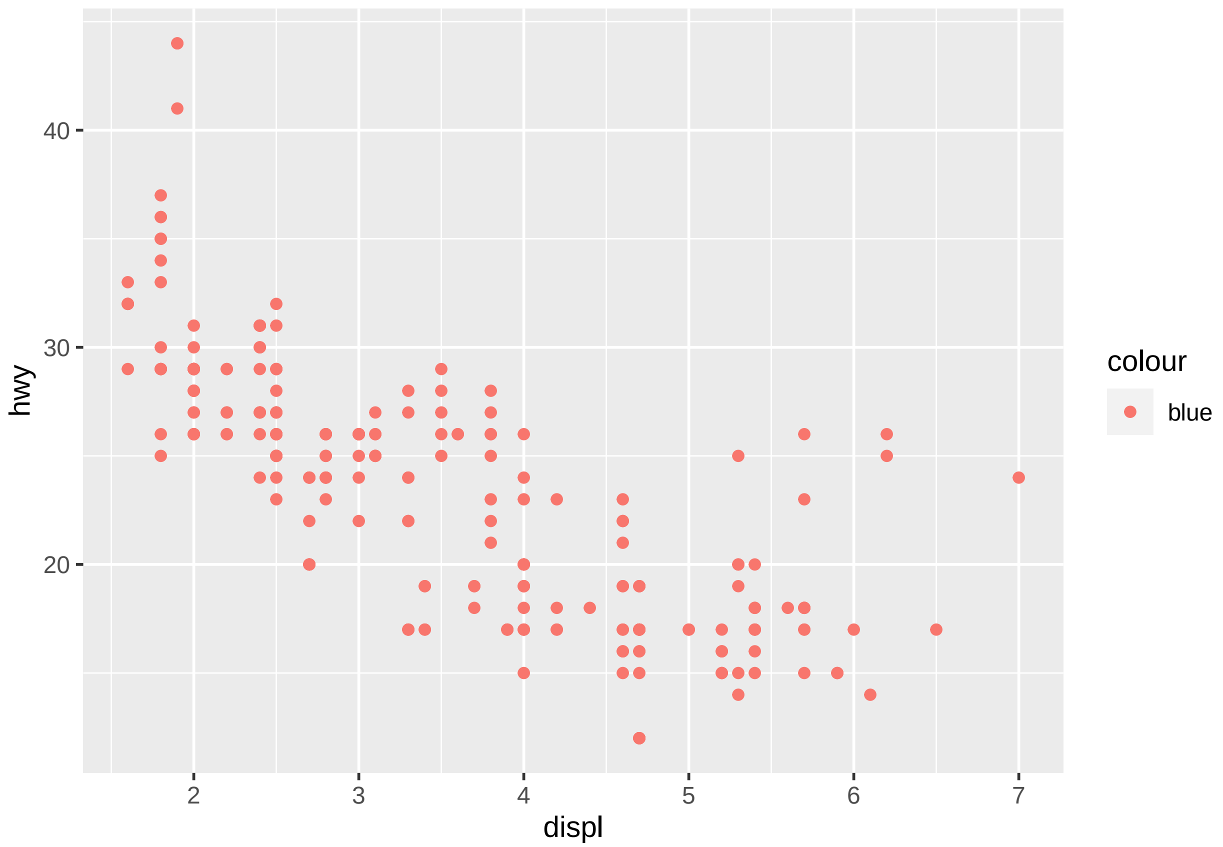


6.b Interpret the result.

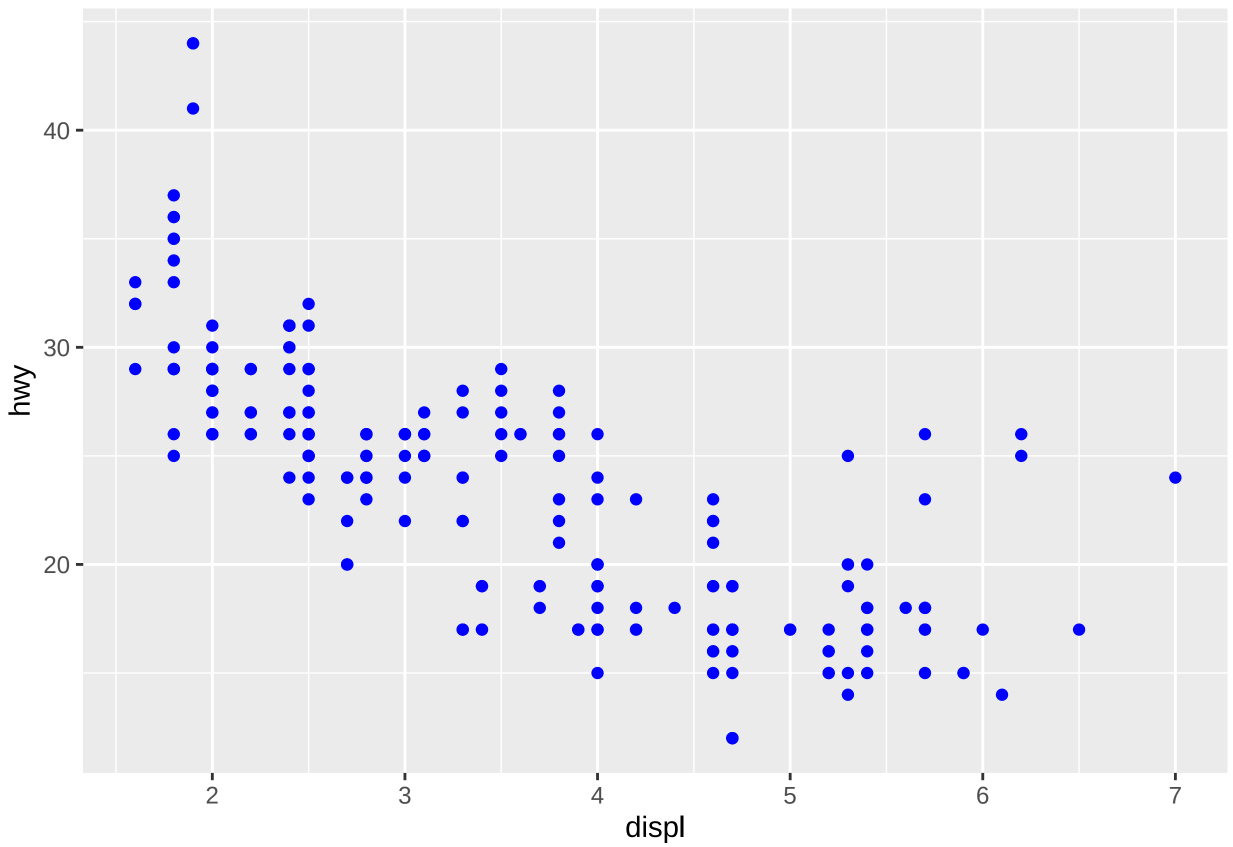
The total number of observations for the drv and class type are displayed in the result. The geom_tile() uses a color scale to show the number of observations with each (x, y) value.

7. Discuss the difference between these codes. Its outputs for each are shown below.

```
#Code 1
ggplot(data = mpg) + geom_point(mapping = aes(x = displ, y = hwy, colour = "blue"))
```



```
#Code 2
ggplot(data = mpg) + geom_point(mapping = aes(x = displ, y = hwy), colour = "blue")
```



The difference between Code 1 and Code 2 is quite easy to tell. We can see that in Code 1, the colour was put inside the geom_point() function and it was resulted with a legend, while in Code 2, the colour was outside the geom_point() function but it has no legend unlike Code 1. But the clear difference between the two is that the points in Code 1 are not blue because the "color =" parameter lies within aes(). This means the function will be looking for a column within the mpg dataset called "blue", which does not exist.

8. Try to run the command ?mpg. What is the result of this command?

```
?mpg
```

```
## starting httpd help server ... done
```

8.a Which variables from mpg dataset are categorial?

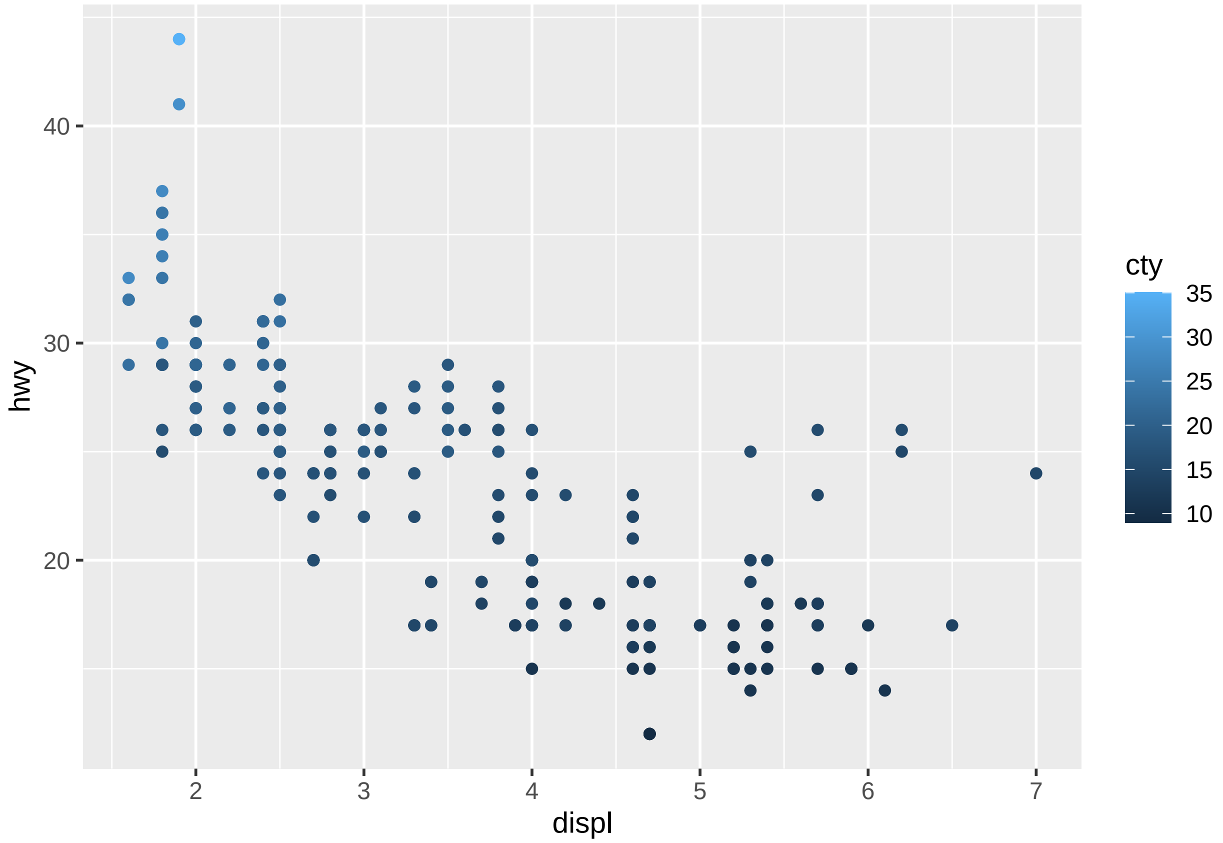
The variables that are categorical in the mpg data set are manufacturer, model, trans, drv, fl, and class.

8.b Which are continuous variables?

The continuous variables in the mpg data set are displ, year, cyl.

8.c. Plot the relationship between displ (engine displacement) and hwy(highway miles per gallon). Mapped it with a continuous variable you have identified in #5-b. What is its result? Why it produced such output?

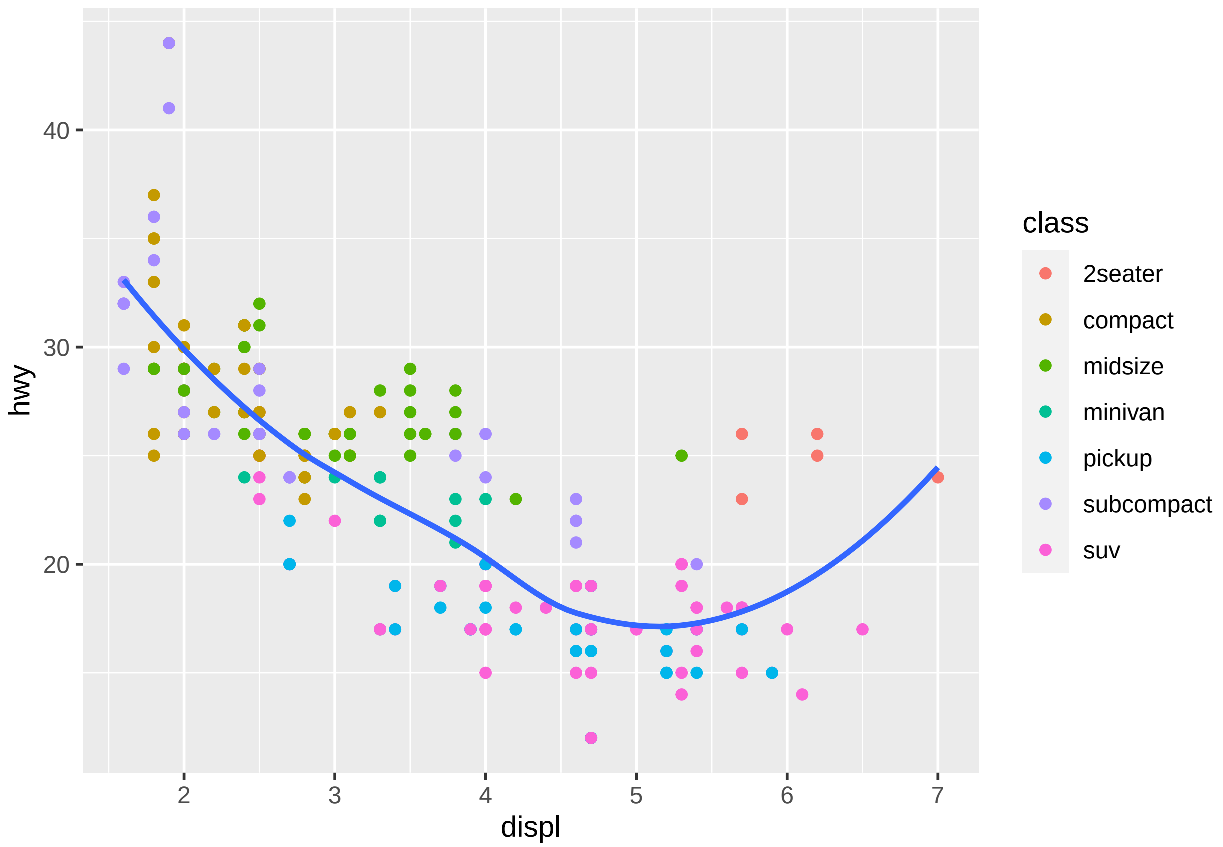
```
ggplot(mpg, aes(x = displ, y = hwy, colour = cty)) + geom_point()
```



9. Plot the relationship between displ (engine displacement) and hwy(highway miles per gallon) using geom_point(). Add a trend line over the existing plot using geom_smooth() with se = FALSE. Default method is “loess”.

```
ggplot(data= mpg, mapping = aes(x= displ, y= hwy)) + geom_point(mapping= aes(color= class)) +
  geom_smooth(se= FALSE)
```

```
## ‘geom_smooth()‘ using method = ’loess’ and formula = ’y ~ x’
```



10.Using the relationship of displ and hwy, add a trend line over existing plot. Set the se = FALSE to remove the confidence interval and method = lm to check for linear modeling

```
ggplot(data= mpg, mapping= aes(x= displ, y= hwy, color= class)) + geom_point() +
  geom_smooth(se= FALSE)
```

```
## `geom_smooth()` using method = 'loess' and formula = 'y ~ x'
```

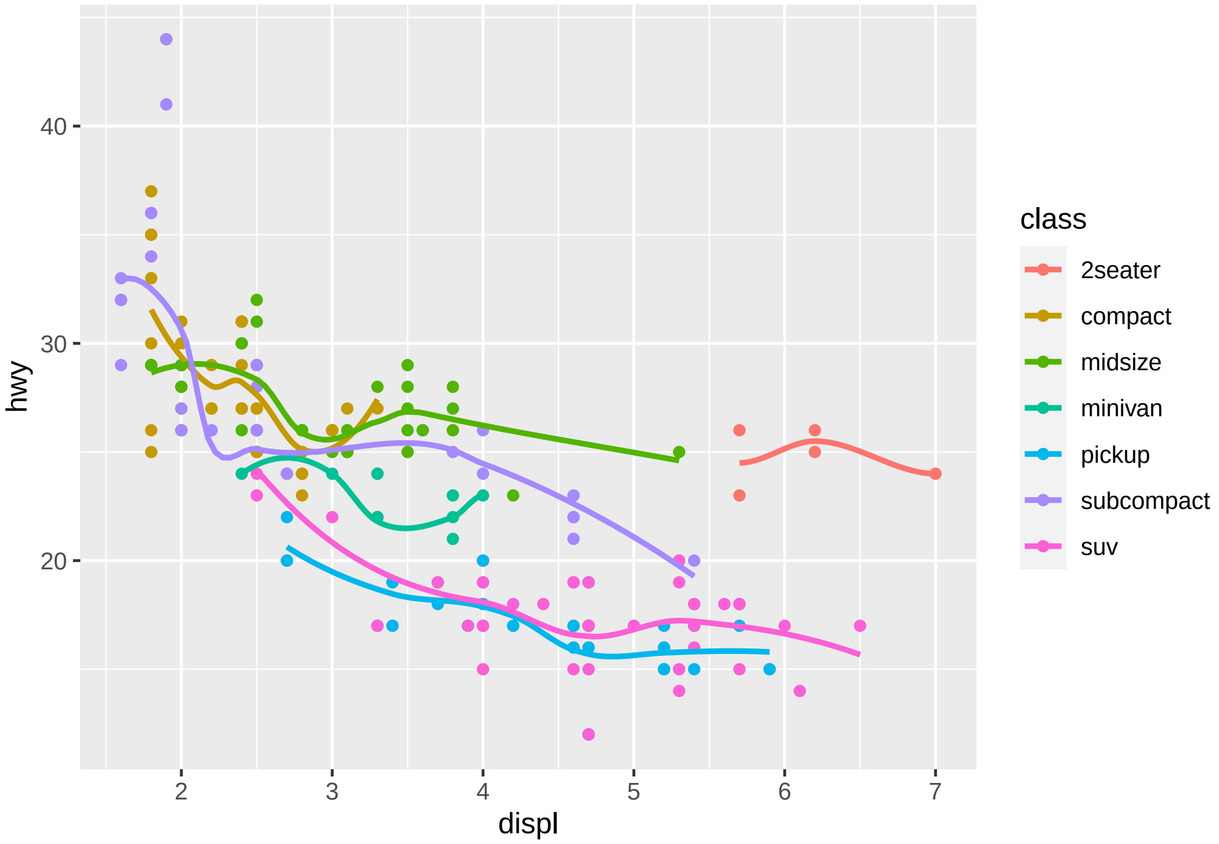
```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : span too small. fewer data values than degrees of freedom.
```

```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : pseudoinverse used at 5.6935
```

```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : neighborhood radius 0.5065
```

```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : reciprocal condition number 0
```

```
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : There are other near singularities as well. 0.65044
## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : pseudoinverse used at 4.008

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : neighborhood radius 0.708

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : reciprocal condition number 0

## Warning in simpleLoess(y, x, w, span, degree = degree, parametric =
## parametric, : There are other near singularities as well. 0.25
```


hwy
displ
class
2seater
compact
midsize
minivan
pickup
subcompact
suv