PS3 Solutions

Jingle Fu, Chaitanya Venkateswaran

R Code With Solutions

```r
#1.1
data(mtcars)
#1.2
ncol(mtcars)
```

```
11
```

```r
nrow(mtcars)
```

```
32
```

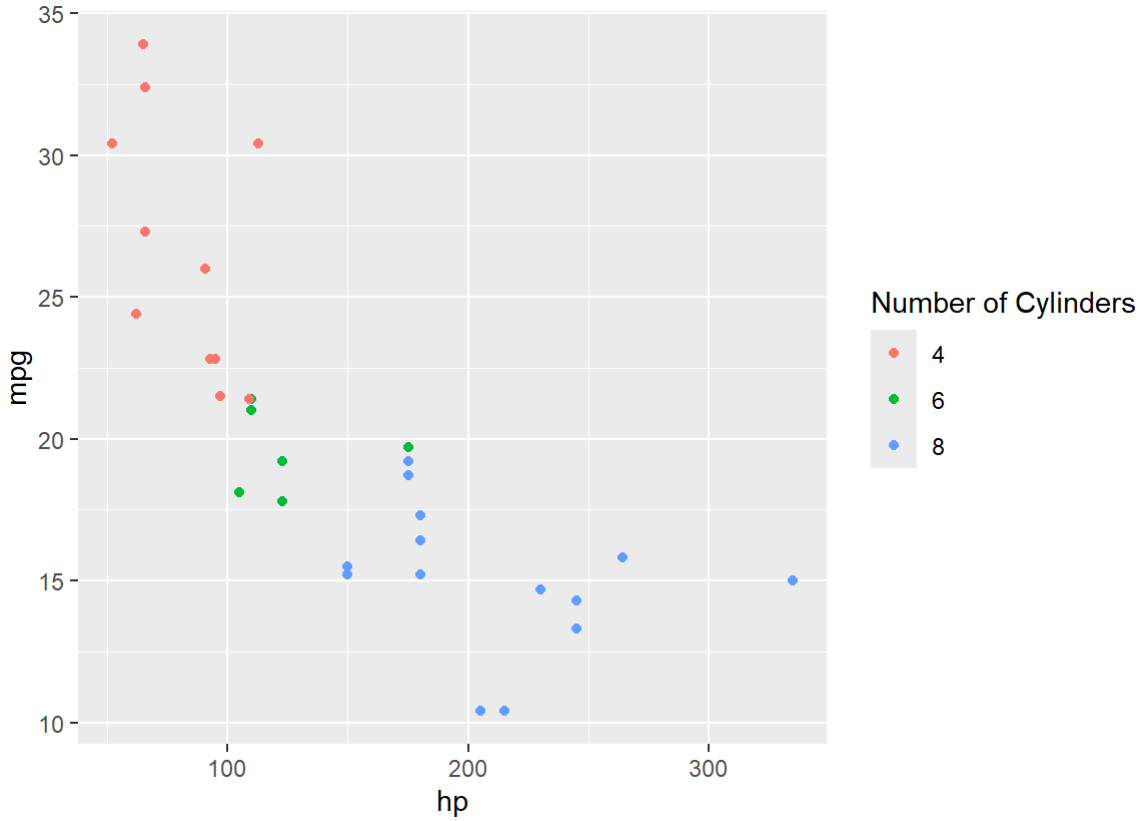
```r
#1.3
library(dplyr)
selected_data <- select(mtcars, mpg, cyl, hp)
mtcars %>% select('mpg', 'cyl', 'hp')
```

```
                   mpg cyl  hp
Mazda RX4         21.0   6 110
Mazda RX4 Wag     21.0   6 110
Datsun 710        22.8   4  93
Hornet 4 Drive    21.4   6 110
Hornet Sportabout 18.7   8 175
Valiant           18.1   6 105
Duster 360        14.3   8 245
Merc 240D         24.4   4  62
Merc 230          22.8   4  95
Merc 280          19.2   6 123
Merc 280C         17.8   6 123
```

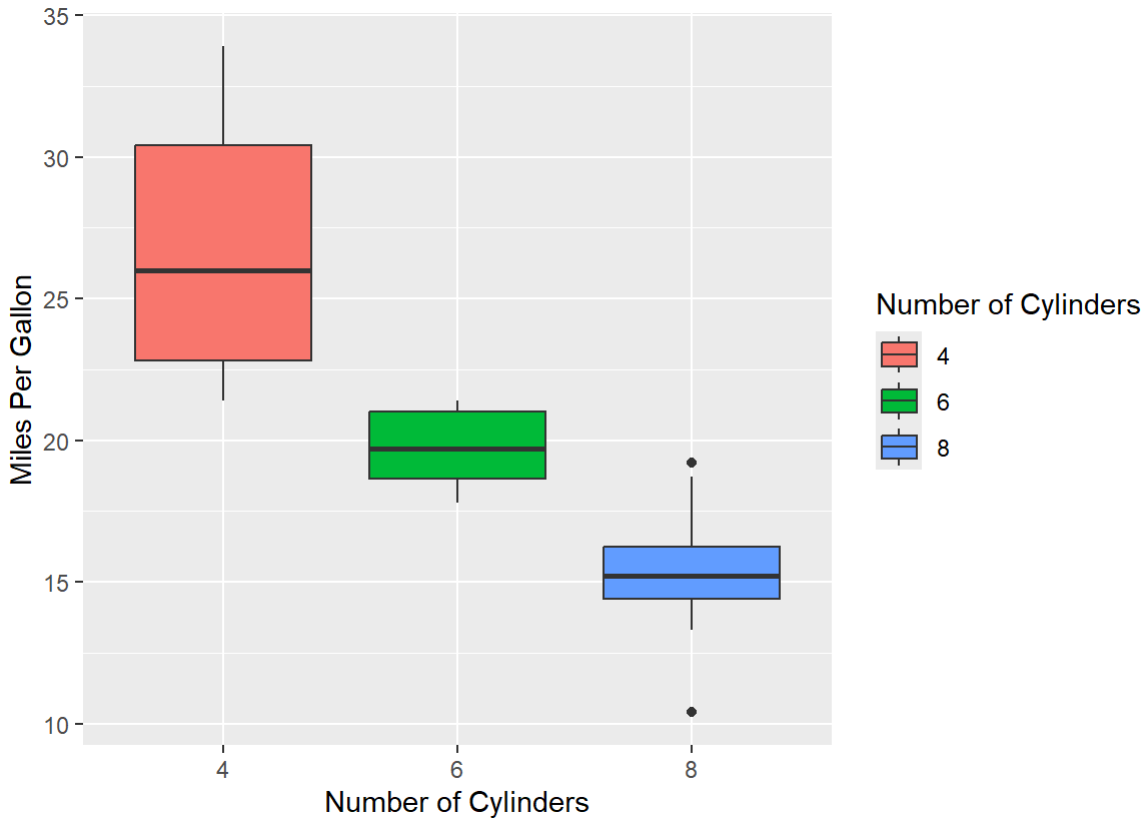
```
Merc 450SE          16.4   8 180
Merc 450SL          17.3   8 180
Merc 450SLC         15.2   8 180
Cadillac Fleetwood  10.4   8 205
Lincoln Continental 10.4   8 215
Chrysler Imperial   14.7   8 230
Fiat 128            32.4   4  66
Honda Civic         30.4   4  52
Toyota Corolla      33.9   4  65
Toyota Corona       21.5   4  97
Dodge Challenger    15.5   8 150
AMC Javelin         15.2   8 150
Camaro Z28          13.3   8 245
Pontiac Firebird    19.2   8 175
Fiat X1-9           27.3   4  66
Porsche 914-2       26.0   4  91
Lotus Europa        30.4   4 113
Ford Pantera L      15.8   8 264
Ferrari Dino        19.7   6 175
Maserati Bora       15.0   8 335
Volvo 142E          21.4   4 109
#1.4
data1_4 <- filter(mtcars, cyl == 6, hp > 100)
mtcars %>% filter(cyl == 6, hp > 100)
                mpg cyl  disp  hp drat    wt  qsec vs am gear carb
Mazda RX4      21.0   6 160.0 110 3.90 2.620 16.46  0  1    4    4
Mazda RX4 Wag  21.0   6 160.0 110 3.90 2.875 17.02  0  1    4    4
Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44  1  0    3    1
Valiant        18.1   6 225.0 105 2.76 3.460 20.22  1  0    3    1
Merc 280       19.2   6 167.6 123 3.92 3.440 18.30  1  0    4    4
Merc 280C      17.8   6 167.6 123 3.92 3.440 18.90  1  0    4    4
Ferrari Dino   19.7   6 145.0 175 3.62 2.770 15.50  0  1    5    6
```

```r
#1.5
mtcars$hp_per_cyl <- mtcars$hp / mtcars$cyl
#1.6
average_mpg <- mtcars %>%
  group_by(cyl) %>%
  summarize(avg_mpg = mean(mpg))
```

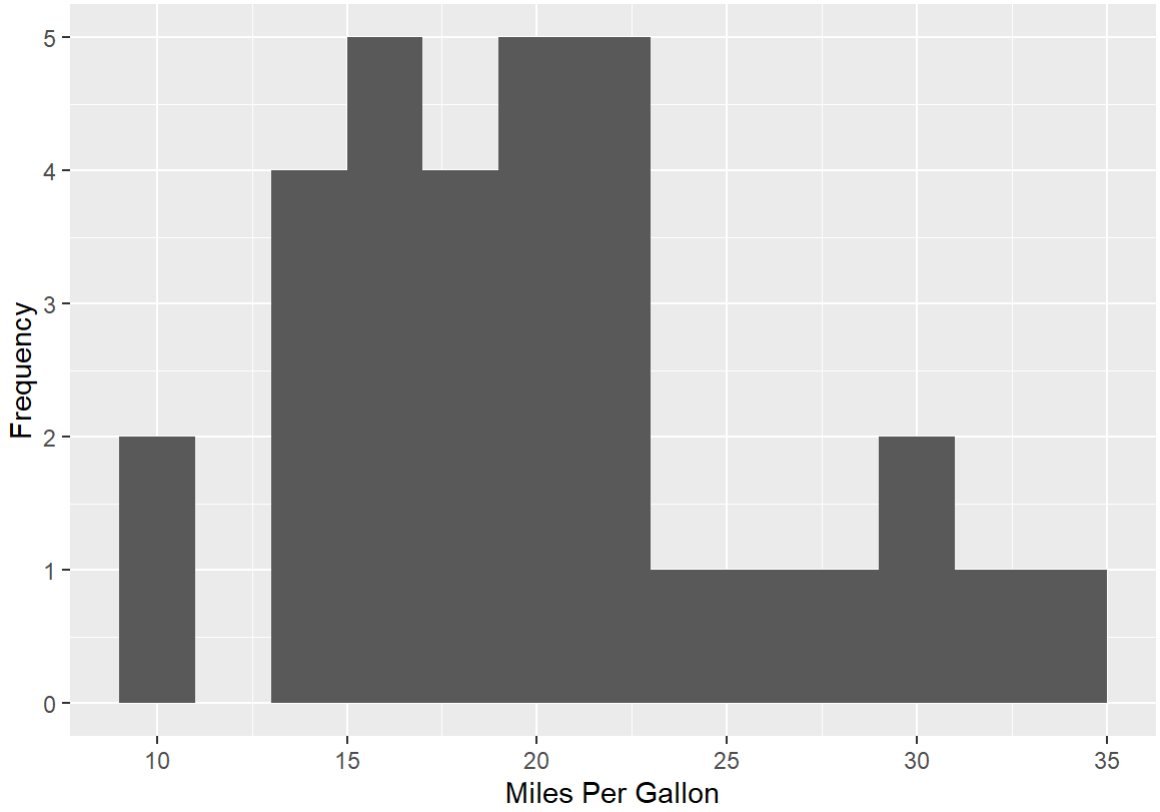
```r
#2.1
library(ggplot2)
ggplot(mtcars, aes(x = hp, y = mpg, color = as.factor(cyl))) +
  geom_point() +
  labs(color = "Number of Cylinders")
```




```r
#2.2
ggplot(mtcars, aes(x = as.factor(cyl), y = mpg, fill = as.factor(cyl))) +
  geom_boxplot() +
  scale_fill_discrete(name = "Number of Cylinders") +
  labs(x = "Number of Cylinders", y = "Miles Per Gallon")
```




```
#2.3
ggplot(mtcars, aes(x = mpg)) +
  geom_histogram(binwidth = 2) +
  xlab("Miles Per Gallon") +
  ylab("Frequency")
```




```r
#3.1
mean_mpg <- mean(mtcars$mpg)
20.09062
mean_hp <- mean(mtcars$hp)
146.6875
#3.2
var_mpg <- var(mtcars$mpg)
36.3241
var_hp <- var(mtcars$hp)
4700.867
#3.3
cov_mpg_hp <- cov(mtcars$mpg, mtcars$hp)
-320.7321
#3.4
cor_mpg_hp <- cor(mtcars$mpg, mtcars$hp)
-0.7761684
```

```r
#4.1
car_names <- data.frame(
  car_model = rownames(mtcars),
  origin = c(rep('USA', 10), rep('Europe', 10), rep('Japan', 12))
)

mtcars$car_model <- rownames(mtcars)
merged_data <- merge(mtcars, car_names, by = "car_model")

#4.2
library(tidyr)
long_format <- pivot_longer(mtcars,
                            cols = -car_model,
                            names_to = "variable",
                            values_to = "value")

#4.3
short_format <- pivot_wider(long_format,
                            names_from = variable,
                            values_from = value,
                            id_cols = car_model)
```

```r
#5.1
library(stargazer)
model <- lm(mpg ~ hp + wt, data = mtcars)
stargazer(model, type = "latex")
#5.2
summary(model)
stargazer(model, type = "latex",
          out = "PS3-5_2.tex",
          title = "Regression Results",
          single.row = TRUE,
```

```
          header = FALSE, no.space = TRUE)
```

Table 1: Linear Regression of hp and wt

	Dependent variable:
	mpg
hp	-0.032^{***}
	(0.009)
wt	-3.878^{***}
	(0.633)
Constant	37.227^{***}
	(1.599)
Observations	32
R^2	0.827
Adjusted R^2	0.815
Residual Std. Error	2.593 (df = 29)
F Statistic	69.211^{***} (df = 2; 29)
Note:	*p<0.1; **p<0.05; ***p<0.01

```
#5.3
predict_mpg <- predict(model, newdata = data.frame(hp = 150, wt = 3.0))
stargazer(predict_mpg, type = "latex")
```

Table 2: Perdiction of mpg

20.828