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---

1 - Load Data

```r
# Importing the "mtcars"
data("mtcars")

# Displaying the structure of the dataset.
str(mtcars)
# Displaying the summary of each column of the dataset.
summary(mtcars)
# Printing the whole dataset.
mtcars
# Printing the head.
head(mtcars)

```

The summary of the dataset:

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

The struct of the dataset:

```
> # Displaying the structure of the dataset.
> str(mtcars)
'data.frame':   32 obs. of  11 variables:
 $ mpg : num  21 21 22.8 21.4 18.7 18.1 14.3 24.4 22.8 19.2 ...
 $ cyl : num  6 6 4 6 8 6 8 4 4 6 ...
 $ disp: num  160 160 108 258 360 ...
 $ hp  : num  110 110 93 110 175 105 245 62 95 123 ...
 $ drat: num  3.9 3.9 3.85 3.08 3.15 2.76 3.21 3.69 3.92 3.92 ...
 $ wt  : num  2.62 2.88 2.32 3.21 3.44 ...
 $ qsec: num  16.5 17 18.6 19.4 17 ...
 $ vs  : num  0 0 1 1 0 1 0 1 1 1 ...
 $ am  : num  1 1 1 0 0 0 0 0 0 0 ...
 $ gear: num  4 4 4 3 3 3 3 4 4 4 ...
 $ carb: num  4 4 1 1 2 1 4 2 2 4 ...
```

The number of observations is **32** and the number of variables is 11.

From the dataset we can see that **(cyl, vs, am, gear, carb)** these variables are categorical variables but we are importing them as numerical, so it's better to convert them to categorical or **(Factor).**

```
# Redefining "mtcars" to get more information.
mtcars2 = within(mtcars,
                 {
                   cyl <- ordered(cyl)
                   gear <- ordered(gear)
                   carb <- ordered(gear)
                   vs <- factor(vs, labels = c("V_shaped", "Straight"))
                   am <- factor(am, labels = c("auto", "manual"))
                 })
```

Note:

I noticed that these variables are categorical and I needed to convert them but I got the code from the **official documentations of mtcars dataset.**

Example from the documentations of the dataset:

Examples

```
require(graphics)
pairs(mtcars, main = "mtcars data", gap = 1/4)
coplot(mpg ~ disp | as.factor(cyl), data = mtcars,
       panel = panel.smooth, rows = 1)
## possibly more meaningful, e.g., for summary() or biva
mtcars2 <- within(mtcars, {
   vs <- factor(vs, labels = c("V", "S"))
   am <- factor(am, labels = c("automatic", "manual"))
   cyl  <- ordered(cyl)
   gear <- ordered(gear)
   carb <- ordered(carb)
})
summary(mtcars2)
```

Printing the head of the dataset:

```
> # Printing the head.
> head(mtcars2)
                   mpg cyl disp  hp drat    wt  qsec       vs     am gear carb
Mazda RX4         21.0   6  160 110 3.90 2.620 16.46 V_shaped manual    4    4
Mazda RX4 Wag     21.0   6  160 110 3.90 2.875 17.02 V_shaped manual    4    4
Datsun 710        22.8   4  108  93 3.85 2.320 18.61 Straight manual    4    4
Hornet 4 Drive    21.4   6  258 110 3.08 3.215 19.44 Straight   auto    3    3
Hornet Sportabout 18.7   8  360 175 3.15 3.440 17.02 V_shaped   auto    3    3
Valiant           18.1   6  225 105 2.76 3.460 20.22 Straight   auto    3    3
>
```

---

2 - Extracting Information

```
# The head of automatic cars.
head(mtcars2[which(mtcars2$am == "auto"),])  # 0 for automatic
# The head of manual cars.
head(mtcars2[which(mtcars2$am == "manual"),])  # 1 for manual
```

The head of automatic cars:

```
> # The head of automatic cars.
> head(mtcars2[which(mtcars2$am == "auto"),])  # 0 for automatic
                   mpg cyl  disp  hp drat    wt  qsec       vs   am gear carb
Hornet 4 Drive    21.4   6 258.0 110 3.08 3.215 19.44 Straight auto    3    3
Hornet Sportabout 18.7   8 360.0 175 3.15 3.440 17.02 V_shaped auto    3    3
Valiant           18.1   6 225.0 105 2.76 3.460 20.22 Straight auto    3    3
Duster 360        14.3   8 360.0 245 3.21 3.570 15.84 V_shaped auto    3    3
Merc 240D         24.4   4 146.7  62 3.69 3.190 20.00 Straight auto    4    4
Merc 230          22.8   4 140.8  95 3.92 3.150 22.90 Straight auto    4    4
> # The head of manual cars.
```

The head of manual cars:

```
> # The head of manual cars.
> head(mtcars2[which(mtcars2$am == "manual"),])  # 1 for manual
               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 V_shaped manual    4    4
Mazda RX4 Wag 21.0   6 160.0 110 3.90 2.875 17.02 V_shaped manual    4    4
Datsun 710    22.8   4 108.0  93 3.85 2.320 18.61 Straight manual    4    4
Fiat 128      32.4   4  78.7  66 4.08 2.200 19.47 Straight manual    4    4
Honda Civic   30.4   4  75.7  52 4.93 1.615 18.52 Straight manual    4    4
Toyota Corolla 33.9  4  71.1  65 4.22 1.835 19.90 Straight manual    4    4
>
```

Displaying Top 10 car:

```
# Top 10 cars based on Displacement.
mtcars2[order(-mtcars2$disp),][0:10,]  # First Method.
head(mtcars2[order(-mtcars2$disp),], 10)  # Second Method.

# Top 10 cars based on hp (Horse Power)
mtcars2[order(-mtcars2$hp),][0:10,]  # First Method.
head(mtcars2[order(-mtcars2$hp),], 10)  # Second Method.

# Top 10 cars based on drat (Rear axle ratio)
mtcars2[order(-mtcars2$drat),][0:10,]  # First Method.
head(mtcars2[order(-mtcars2$drat),], 10)  # Second Method.
```

Top 10 cars based on Displacement:

```
> # Top 10 cars based on Displacement.
> mtcars2[order(-mtcars2$disp),][0:10,]  # First Method.
                    mpg cyl disp  hp drat    wt  qsec       vs      am gear carb
Cadillac Fleetwood  10.4   8  472 205 2.93 5.250 17.98 V_shaped   auto    3    3
Lincoln Continental 10.4   8  460 215 3.00 5.424 17.82 V_shaped   auto    3    3
Chrysler Imperial   14.7   8  440 230 3.23 5.345 17.42 V_shaped   auto    3    3
Pontiac Firebird    19.2   8  400 175 3.08 3.845 17.05 V_shaped   auto    3    3
Hornet Sportabout   18.7   8  360 175 3.15 3.440 17.02 V_shaped   auto    3    3
Duster 360          14.3   8  360 245 3.21 3.570 15.84 V_shaped   auto    3    3
Ford Pantera L      15.8   8  351 264 4.22 3.170 14.50 V_shaped manual    5    5
Camaro Z28          13.3   8  350 245 3.73 3.840 15.41 V_shaped   auto    3    3
Dodge Challenger    15.5   8  318 150 2.76 3.520 16.87 V_shaped   auto    3    3
AMC Javelin         15.2   8  304 150 3.15 3.435 17.30 V_shaped   auto    3    3
> head(mtcars2[order(-mtcars2$disp),], 10)  # Second Method.
                    mpg cyl disp  hp drat    wt  qsec       vs      am gear carb
Cadillac Fleetwood  10.4   8  472 205 2.93 5.250 17.98 V_shaped   auto    3    3
Lincoln Continental 10.4   8  460 215 3.00 5.424 17.82 V_shaped   auto    3    3
Chrysler Imperial   14.7   8  440 230 3.23 5.345 17.42 V_shaped   auto    3    3
Pontiac Firebird    19.2   8  400 175 3.08 3.845 17.05 V_shaped   auto    3    3
Hornet Sportabout   18.7   8  360 175 3.15 3.440 17.02 V_shaped   auto    3    3
Duster 360          14.3   8  360 245 3.21 3.570 15.84 V_shaped   auto    3    3
Ford Pantera L      15.8   8  351 264 4.22 3.170 14.50 V_shaped manual    5    5
Camaro Z28          13.3   8  350 245 3.73 3.840 15.41 V_shaped   auto    3    3
Dodge Challenger    15.5   8  318 150 2.76 3.520 16.87 V_shaped   auto    3    3
AMC Javelin         15.2   8  304 150 3.15 3.435 17.30 V_shaped   auto    3    3
>
```

Top 10 cars based on hp (Horse Power):

```
> # Top 10 cars based on hp (Horse Power)
> mtcars2[order(-mtcars2$hp),][0:10,]  # First Method.
                    mpg cyl  disp  hp drat    wt  qsec       vs      am gear carb
Maserati Bora      15.0   8 301.0 335 3.54 3.570 14.60 V_shaped manual    5    5
Ford Pantera L     15.8   8 351.0 264 4.22 3.170 14.50 V_shaped manual    5    5
Duster 360         14.3   8 360.0 245 3.21 3.570 15.84 V_shaped   auto    3    3
Camaro Z28         13.3   8 350.0 245 3.73 3.840 15.41 V_shaped   auto    3    3
Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42 V_shaped   auto    3    3
Lincoln Continental 10.4  8 460.0 215 3.00 5.424 17.82 V_shaped   auto    3    3
Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98 V_shaped   auto    3    3
Merc 450SE         16.4   8 275.8 180 3.07 4.070 17.40 V_shaped   auto    3    3
Merc 450SL         17.3   8 275.8 180 3.07 3.730 17.60 V_shaped   auto    3    3
Merc 450SLC        15.2   8 275.8 180 3.07 3.780 18.00 V_shaped   auto    3    3
> head(mtcars2[order(-mtcars2$hp),], 10)  # Second Method.
                    mpg cyl  disp  hp drat    wt  qsec       vs      am gear carb
Maserati Bora      15.0   8 301.0 335 3.54 3.570 14.60 V_shaped manual    5    5
Ford Pantera L     15.8   8 351.0 264 4.22 3.170 14.50 V_shaped manual    5    5
Duster 360         14.3   8 360.0 245 3.21 3.570 15.84 V_shaped   auto    3    3
Camaro Z28         13.3   8 350.0 245 3.73 3.840 15.41 V_shaped   auto    3    3
Chrysler Imperial  14.7   8 440.0 230 3.23 5.345 17.42 V_shaped   auto    3    3
Lincoln Continental 10.4  8 460.0 215 3.00 5.424 17.82 V_shaped   auto    3    3
Cadillac Fleetwood 10.4   8 472.0 205 2.93 5.250 17.98 V_shaped   auto    3    3
Merc 450SE         16.4   8 275.8 180 3.07 4.070 17.40 V_shaped   auto    3    3
Merc 450SL         17.3   8 275.8 180 3.07 3.730 17.60 V_shaped   auto    3    3
Merc 450SLC        15.2   8 275.8 180 3.07 3.780 18.00 V_shaped   auto    3    3
>
```

Top 10 cars based on drat (Rear axle ratio):

```
> # Top 10 cars based on drat (Rear axle ratio)
> mtcars2[order(-mtcars2$drat),][0:10,]  # First Method.
                mpg cyl  disp  hp drat    wt  qsec       vs     am gear carb
Honda Civic    30.4   4  75.7  52 4.93 1.615 18.52 Straight manual    4    4
Porsche 914-2  26.0   4 120.3  91 4.43 2.140 16.70 V_shaped manual    5    5
Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 Straight manual    4    4
Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.50 V_shaped manual    5    5
Volvo 142E     21.4   4 121.0 109 4.11 2.780 18.60 Straight manual    4    4
Fiat 128       32.4   4  78.7  66 4.08 2.200 19.47 Straight manual    4    4
Fiat X1-9      27.3   4  79.0  66 4.08 1.935 18.90 Straight manual    4    4
Merc 230       22.8   4 140.8  95 3.92 3.150 22.90 Straight   auto    4    4
Merc 280       19.2   6 167.6 123 3.92 3.440 18.30 Straight   auto    4    4
Merc 280C      17.8   6 167.6 123 3.92 3.440 18.90 Straight   auto    4    4
> head(mtcars2[order(-mtcars2$drat),], 10)  # Second Method.
                mpg cyl  disp  hp drat    wt  qsec       vs     am gear carb
Honda Civic    30.4   4  75.7  52 4.93 1.615 18.52 Straight manual    4    4
Porsche 914-2  26.0   4 120.3  91 4.43 2.140 16.70 V_shaped manual    5    5
Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 Straight manual    4    4
Ford Pantera L 15.8   8 351.0 264 4.22 3.170 14.50 V_shaped manual    5    5
Volvo 142E     21.4   4 121.0 109 4.11 2.780 18.60 Straight manual    4    4
Fiat 128       32.4   4  78.7  66 4.08 2.200 19.47 Straight manual    4    4
Fiat X1-9      27.3   4  79.0  66 4.08 1.935 18.90 Straight manual    4    4
Merc 230       22.8   4 140.8  95 3.92 3.150 22.90 Straight   auto    4    4
Merc 280       19.2   6 167.6 123 3.92 3.440 18.30 Straight   auto    4    4
Merc 280C      17.8   6 167.6 123 3.92 3.440 18.90 Straight   auto    4    4
>
```

Cars with mpg above the mean:

```
# Cars with mpg above the mean mpg
average.mpg <- mean(mtcars2$mpg)
mtcars2[which(mtcars2$mpg > average.mpg),]
```

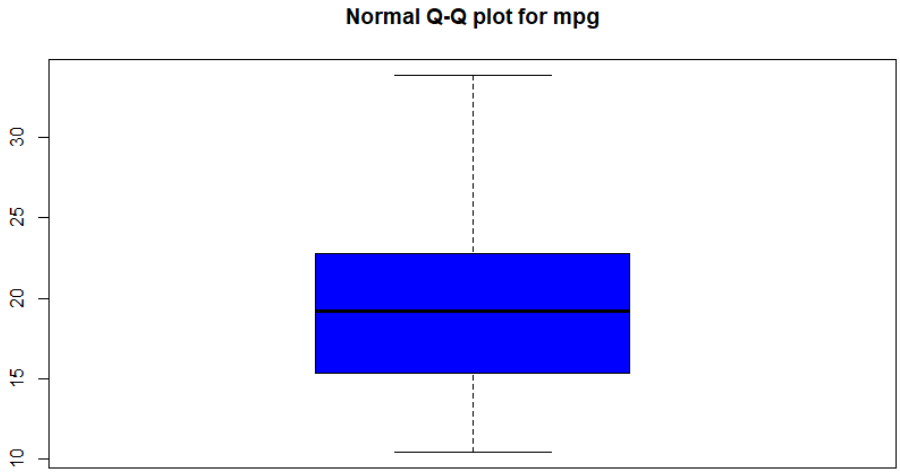
```
> # Cars with mpg above the mean mpg
> average.mpg <- mean(mtcars2$mpg)
> mtcars2[which(mtcars2$mpg > average.mpg),]
                mpg cyl  disp  hp drat    wt  qsec       vs     am gear carb
Mazda RX4      21.0   6 160.0 110 3.90 2.620 16.46 V_shaped manual    4    4
Mazda RX4 Wag  21.0   6 160.0 110 3.90 2.875 17.02 V_shaped manual    4    4
Datsun 710     22.8   4 108.0  93 3.85 2.320 18.61 Straight manual    4    4
Hornet 4 Drive 21.4   6 258.0 110 3.08 3.215 19.44 Straight   auto    3    3
Merc 240D      24.4   4 146.7  62 3.69 3.190 20.00 Straight   auto    4    4
Merc 230       22.8   4 140.8  95 3.92 3.150 22.90 Straight   auto    4    4
Fiat 128       32.4   4  78.7  66 4.08 2.200 19.47 Straight manual    4    4
Honda Civic    30.4   4  75.7  52 4.93 1.615 18.52 Straight manual    4    4
Toyota Corolla 33.9   4  71.1  65 4.22 1.835 19.90 Straight manual    4    4
Toyota Corona  21.5   4 120.1  97 3.70 2.465 20.01 Straight   auto    3    3
Fiat X1-9      27.3   4  79.0  66 4.08 1.935 18.90 Straight manual    4    4
Porsche 914-2  26.0   4 120.3  91 4.43 2.140 16.70 V_shaped manual    5    5
Lotus Europa   30.4   4  95.1 113 3.77 1.513 16.90 Straight manual    5    5
Volvo 142E     21.4   4 121.0 109 4.11 2.780 18.60 Straight manual    4    4
>
```

There are two types of columns in the dataset. Numerical and Categorical, so we can use **Boxplot** on numerical variables and **Histogram** on categorical variables.
We can also use a scatter plot between two variables.

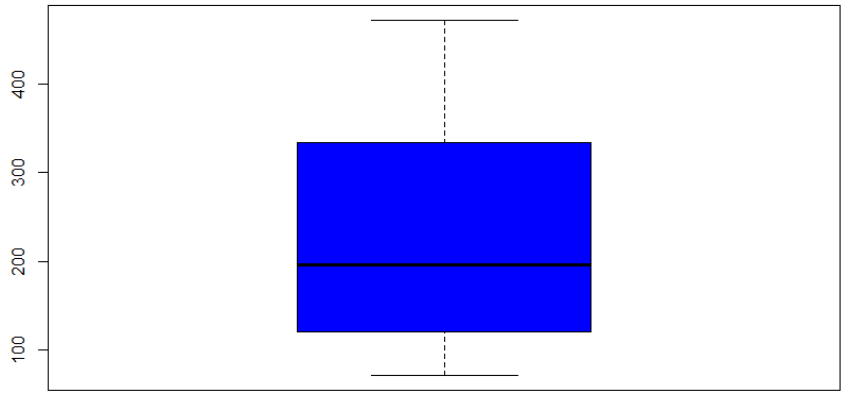
Code to create box plot for numeric variables only:

```r
# Box Plot for numeric variables.
mt.num.cols <- mtcars2[sapply(mtcars2, is.numeric)]  # Getting only the numeric columns.
plotting.boxPlot <- function(df)
{
  for (column in colnames(df))
  {
    v <- df[column]

    boxplot(v,
            main = paste("Normal Q-Q plot for", column),
            col = "blue")
  }
}

plotting.boxPlot(mt.num.cols)
```

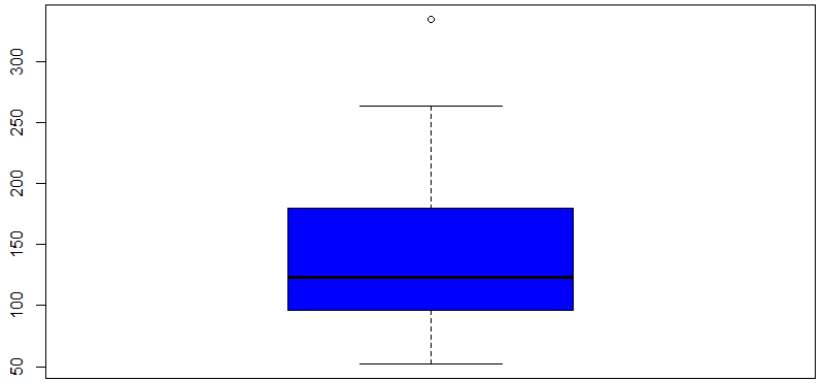
The output of the code:



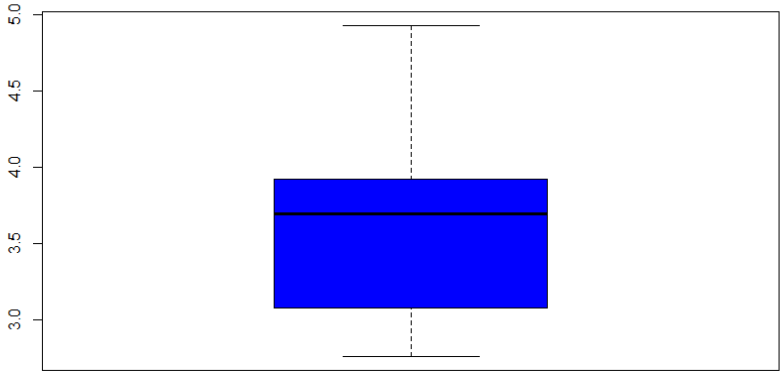
Normal Q-Q plot for disp



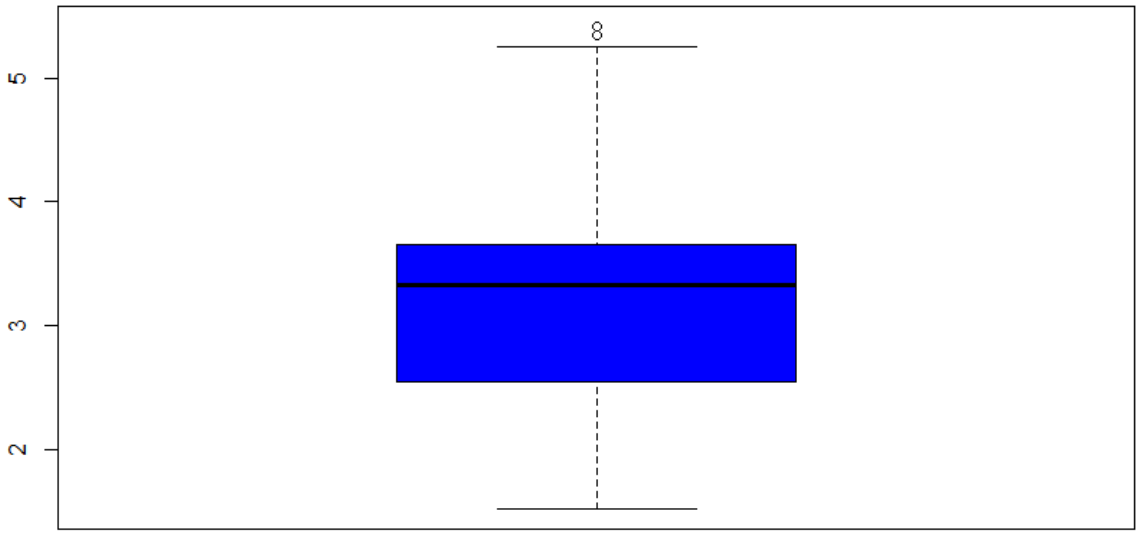
Normal Q-Q plot for hp



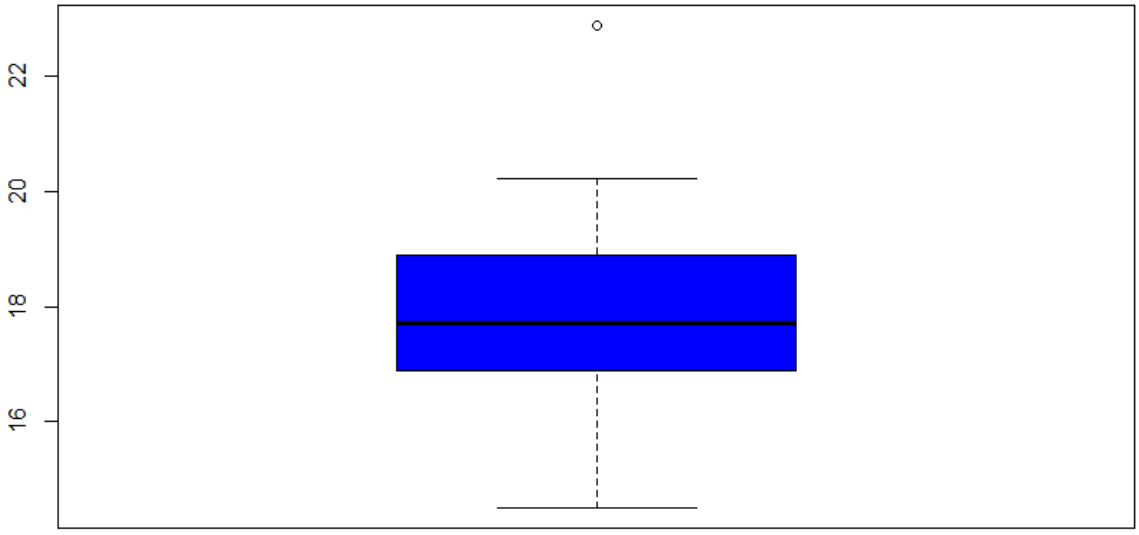
Normal Q-Q plot for drat



Normal Q-Q plot for wt



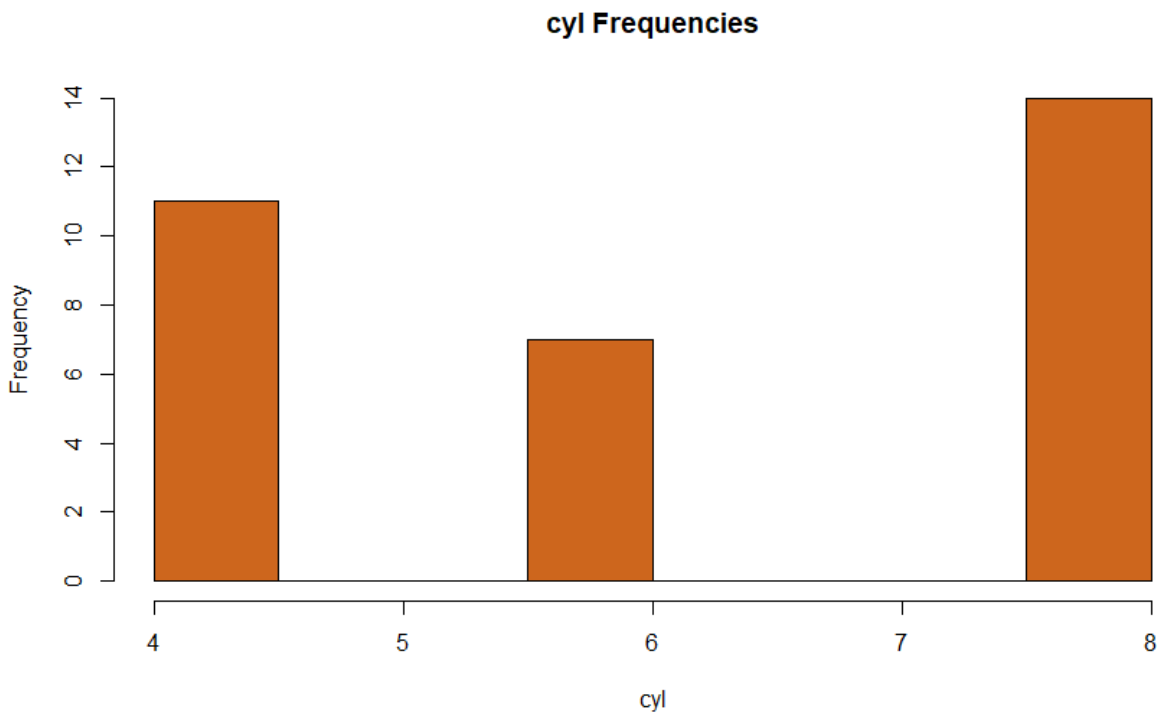
Normal Q-Q plot for qsec

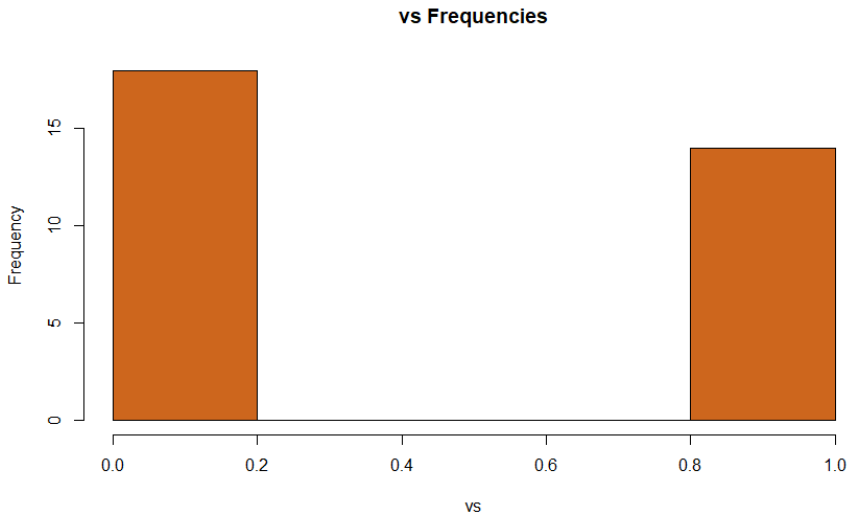


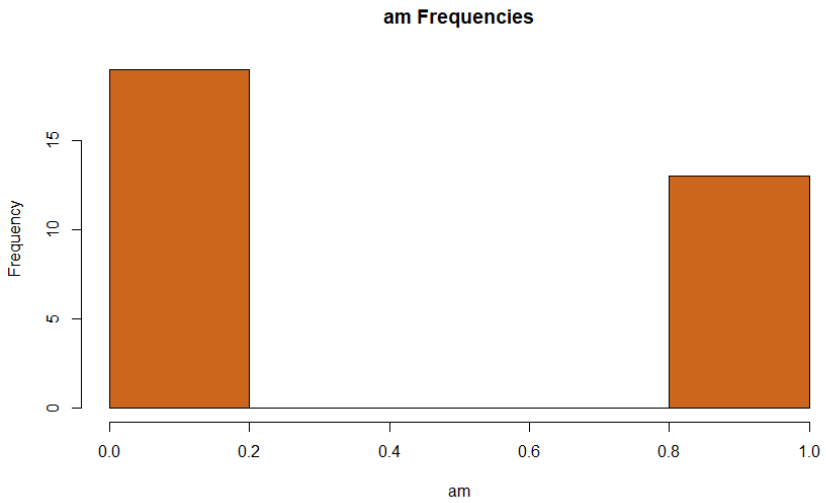
Code to create histogram for categorical variables:

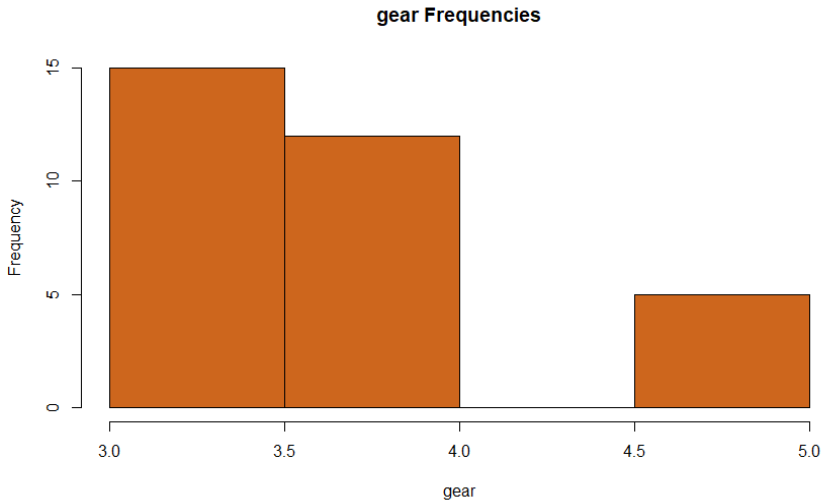
```r
non_numeric_cols <- mtcars[setdiff(colnames(mtcars), colnames(mt.num.cols))]
plotting.histogram <- function(df)
{
  for (column in colnames(df))
  {

    hist(df[[column]],
            main = paste(column, "Frequencies"),
            col = "chocolate3",
            xlab = column,
            ylab = "Frequency")
  }
}

plotting.histogram(non_numeric_cols)
```

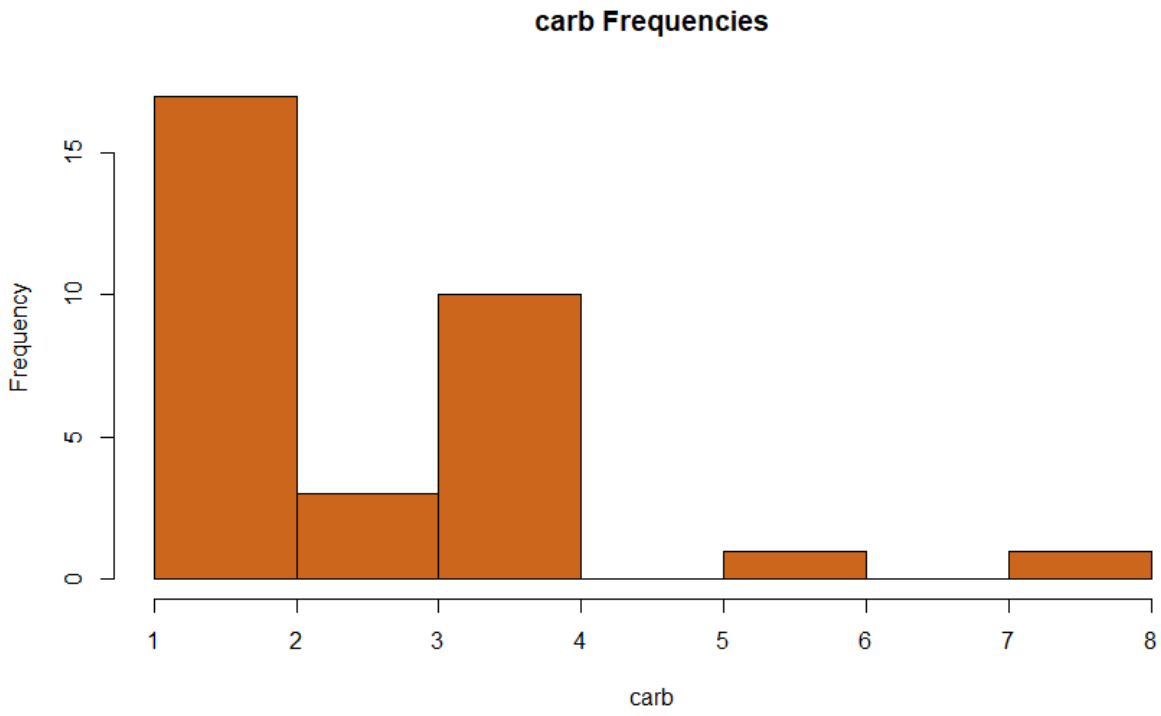
The output of the code:




vs Frequencies
Frequency
0
5
10
15
0.0
0.2
0.4
0.6
0.8
1.0
vs

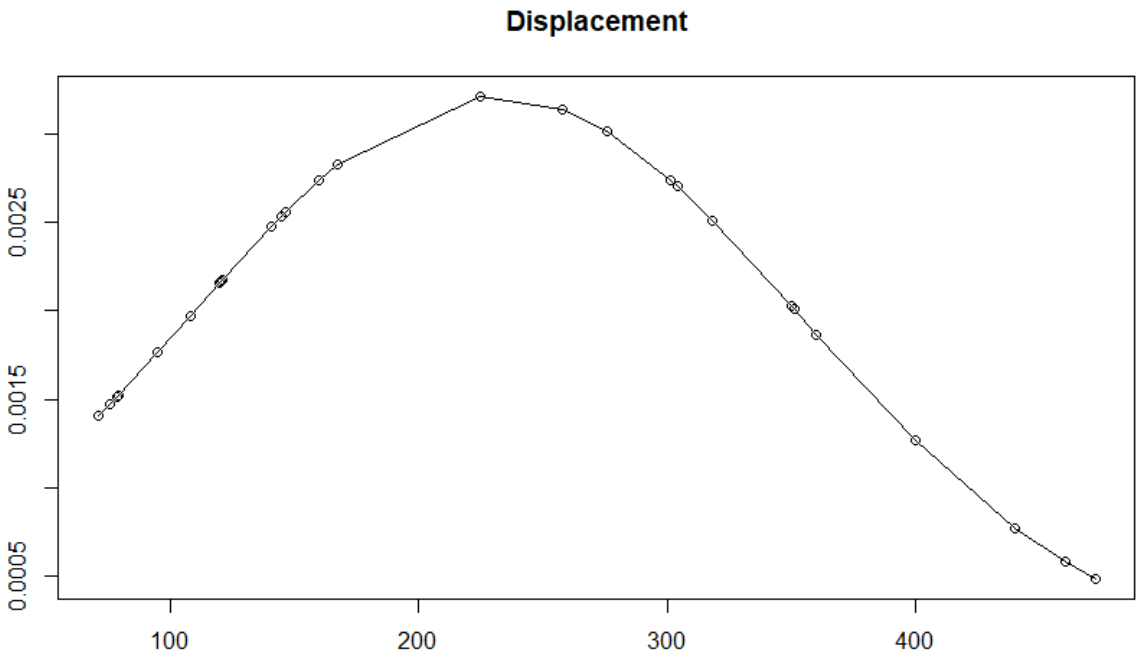

am Frequencies
Frequency
0
5
10
15
0.0
0.2
0.4
0.6
0.8
1.0
am


gear Frequencies
Frequency
0
5
10
15
3.0
3.5
4.0
4.5
5.0
gear


carb Frequencies
Frequency
0
5
10
15
1
2
3
4
5
6
7
8
carb

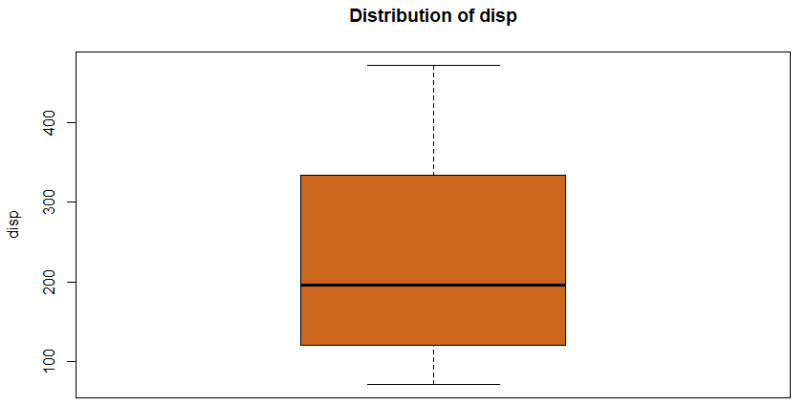
Getting a normal distribution plot for Displacement:

```
# Standard deviation for Displacement
disp.mean <- mean(mtcars2$disp)
disp.sd <- sd(mtcars2$disp)
x <- sort(mtcars2$disp)
y <- dnorm(x, disp.mean, disp.sd)
plot(x, y,
     type = "o",
     xlab = "", ylab = "",
     main = "Displacement")
```



Box plot for disp variable:

```
# box plot for mpg variable.
boxplot(mtcars2$disp,
        col = "chocolate3",
        ylab = "disp",
        main = "Distribution of disp")
summary(mtcars$disp)
```

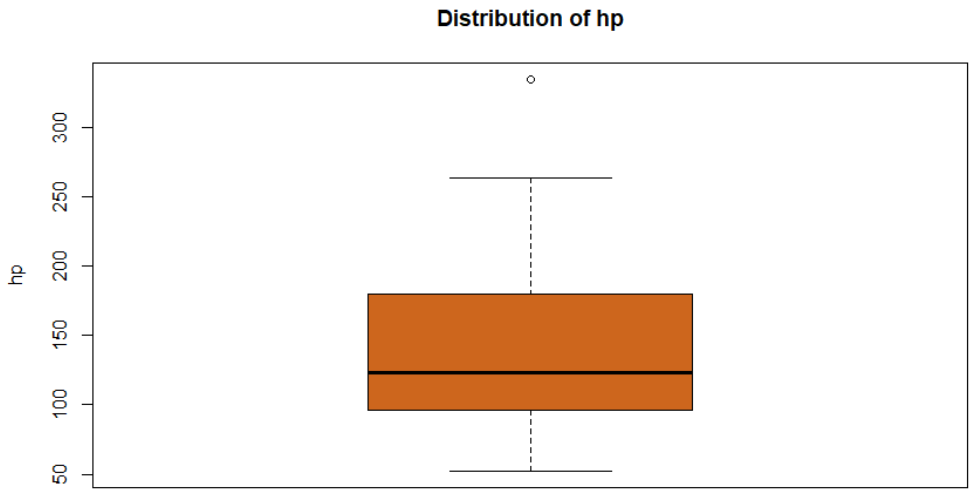


The five percentiles:

```
> # box plot for mpg variable.
> boxplot(mtcars2$disp,
+         col = "chocolate3",
+         ylab = "disp",
+         main = "Distribution of disp")
> summary(mtcars$disp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   71.1   120.8   196.3   230.7   326.0   472.0
>
```

Box plot for hp variable:

```
# box plot for hp variable.
boxplot(mtcars2$hp,
        col = "chocolate3",
        ylab = "hp",
        main = "Distribution of hp")
summary(mtcars$hp)
```

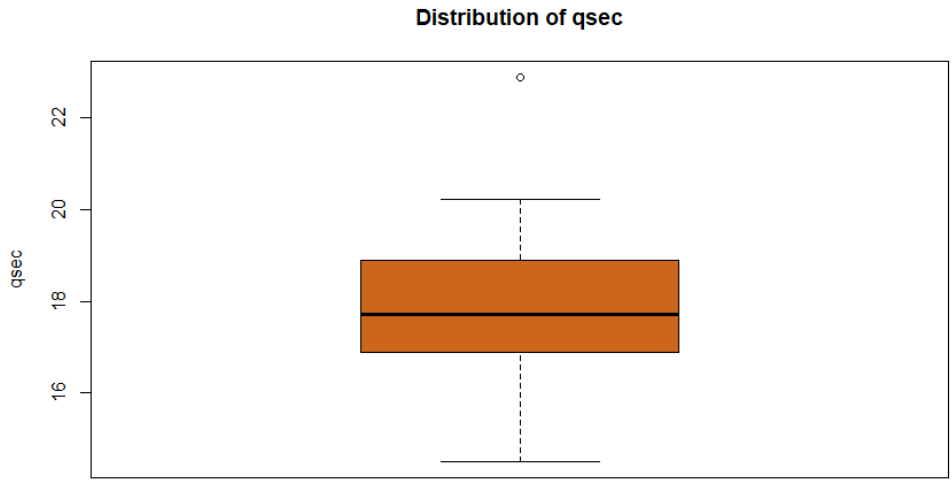


The five percentiles:

```
> # box plot for hp variable.
> boxplot(mtcars2$hp,
+         col = "chocolate3",
+         ylab = "hp",
+         main = "Distribution of hp")
> summary(mtcars$hp)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
   52.0    96.5   123.0   146.7   180.0   335.0
>
```

Box plot for qsec variable

```
# box plot for qsec variable.
boxplot(mtcars2$qsec,
        col = "chocolate3",
        ylab = "qsec",
        main = "Distribution of qsec")
summary(mtcars$qsec)
```




```
> # box plot for qsec variable.
> boxplot(mtcars2$qsec,
+         col = "chocolate3",
+         ylab = "qsec",
+         main = "Distribution of qsec")
> summary(mtcars$qsec)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  14.50   16.89   17.71   17.85   18.90   22.90
>
```

3 - Distributions:

Percentage of cars having 3.4 lbs or more:

```r
# Percentage of cars having 3.4 lbs or more.
wt.mean <- mean(mtcars2$wt)
wt.sd <- sd(mtcars2$wt)
R.V <- sort(mtcars2$wt)
prob_less_than_3.4 <- pnorm(3.4, mean = wt.mean, sd = wt.sd)
prob_more_than_3.4 <- 1 - prob_less_than_3.4

print(prob_more_than_3.4)
```

```
> # Percentage of cars having 3.4 lbs or more.
> wt.mean <- mean(mtcars2$wt)
> wt.sd <- sd(mtcars2$wt)
> R.V <- sort(mtcars2$wt)
> prob_less_than_3.4 <- pnorm(3.4, mean = wt.mean, sd = wt.sd)
> prob_more_than_3.4 <- 1 - prob_less_than_3.4
>
> print(prob_more_than_3.4)
[1] 0.4259191
>
```

Probability of getting 18 or less manual cars:

```r
# Probability of getting 18 or less manual cars
manual_cars <- sum(mtcars2$am == "manual") / length(mtcars2$am)
prob_18_manual_cars <- pbinom(18, 32, manual_cars)

print(prob_18_manual_cars)
```

```
> # Probability of getting 18 or less manual cars
> manual_cars <- sum(mtcars2$am == "manual") / length(mtcars2$am)
> prob_18_manual_cars <- pbinom(18, 32, manual_cars)
>
> print(prob_18_manual_cars)
[1] 0.9751365
>
```

Probability of having four or less spots:

```
# Probability of having four or less spots
prob_4_less <- pbinom(4, 12, 1/5)

print(prob_4_less)
```

```
> # Probability of having four or less spots
> prob_4_less <- pbinom(4, 12, 1/5)
>
> print(prob_4_less)
[1] 0.9274445
>
```

---

4 - Permutations and Combinations:

Number of permutations:

```
# Number of permutations for 3 digit ternary number.
print(3 * 3 * 3)  # Method 1
perm <- choose(3, 1) * factorial(1)  # Method 2
print(perm ** 3)
```

```
> # Number of permutations for 3 digit ternary number.
> print(3 * 3 * 3)  # Method 1
[1] 27
> perm <- choose(3, 1) * factorial(1)  # Method 2
> print(perm ** 3)
[1] 27
>
```

Getting the permutations:

```r
# Getting the permutations.
d1 <- rep(c(0, 1, 2), times=3)
d2 <- rep(c(0, 10, 20), each = 3)
d3 <- rep(c(0, 100, 200), each = 9)
prem <- d1 + d2 + d3
print(prem)
print(length(prem))

# Method 2
num <- 0
while(num <= 222)
{
  cat(num, " ")
  i <- i + 1
  num <- num + 1
  if (num %% 10 > 2)
  {
    num <- num - (num %% 10)
    num <- num + 10
  }
  if (as.integer((num %% 100)/10) > 2)
  {
    num <- num - (num %% 100)
    num <- num + 100
  }
}
```

```
> # Getting the permutations.
> d1 <- rep(c(0, 1, 2), times=3)
> d2 <- rep(c(0, 10, 20), each = 3)
> d3 <- rep(c(0, 100, 200), each = 9)
> prem <- d1 + d2 + d3
> print(prem)
 [1]   0   1   2  10  11  12  20  21  22 100 101 102 110 111 112 120 121 122 200 201 202 210
[23] 211 212 220 221 222
> print(length(prem))
[1] 27
>
```

```
+ }
0  1  2  10  11  12  20  21  22  100  101  102  110  111  112  120  121  122  200  201  202  210
  211  212  220  221  222
>
```

Probability that you get 3 numbers the minimum number is 2 and the maximum is 5:

```r
# Probability that you get 3 numbers where the minimum number is 2 and the maximum is 5
# Method 1
numerator <- choose(4, 3)
denominator <- choose(9, 3)
result <- numerator / denominator

print(result)
```

```
> # Probability that you get 3 numbers where the minimum number is 2 and the maximum is 5
> # Method 1
> numerator <- choose(4, 3)
> denominator <- choose(9, 3)
> result <- numerator / denominator
>
> print(result)
[1] 0.04761905
```

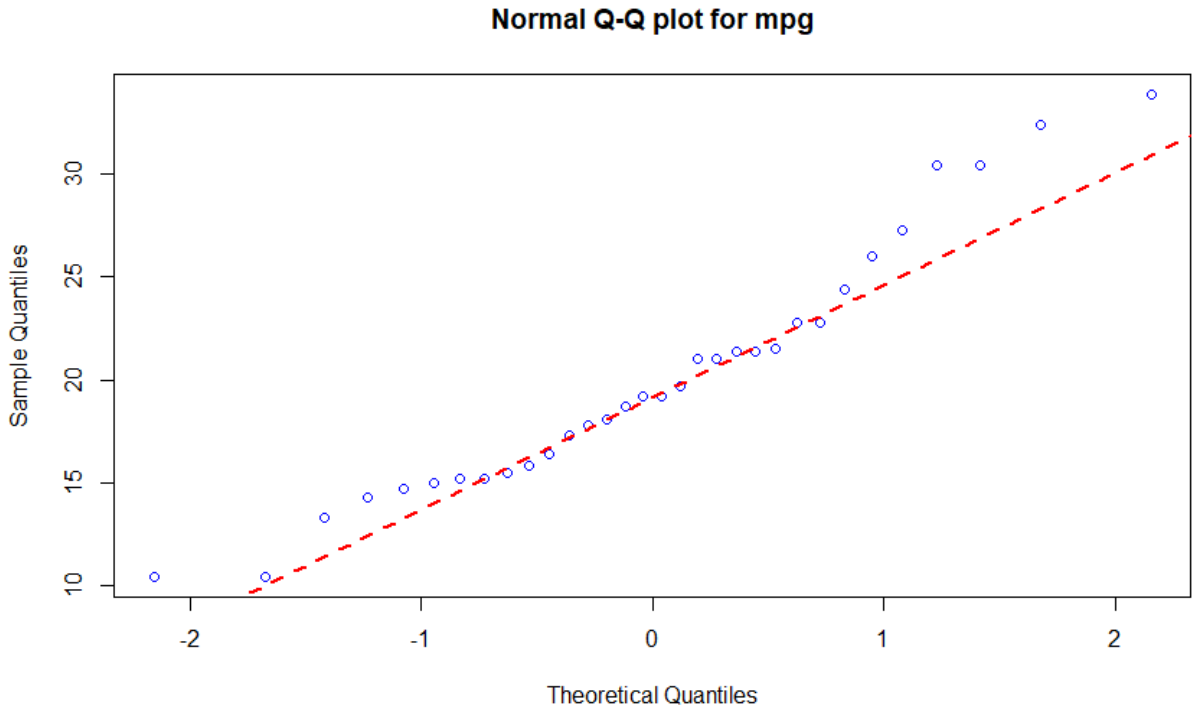
---

5 - Bonus:

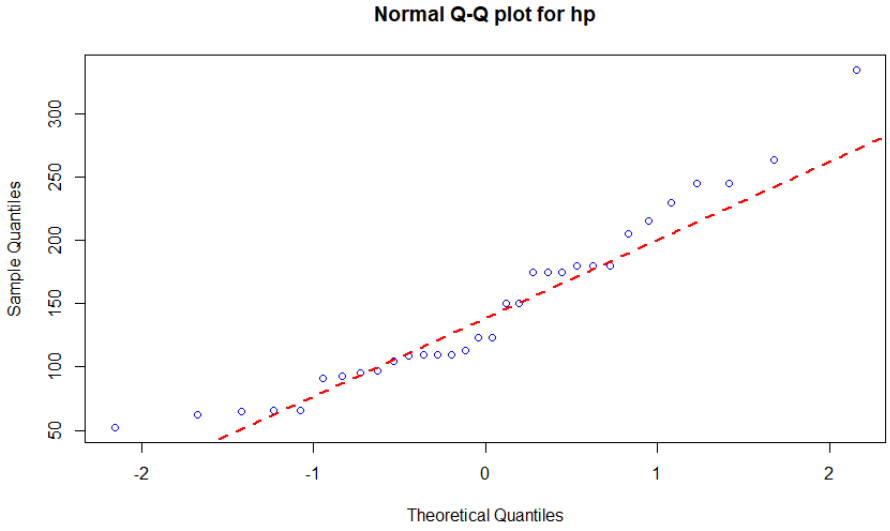
Q-Q plot for mtcars dataset:

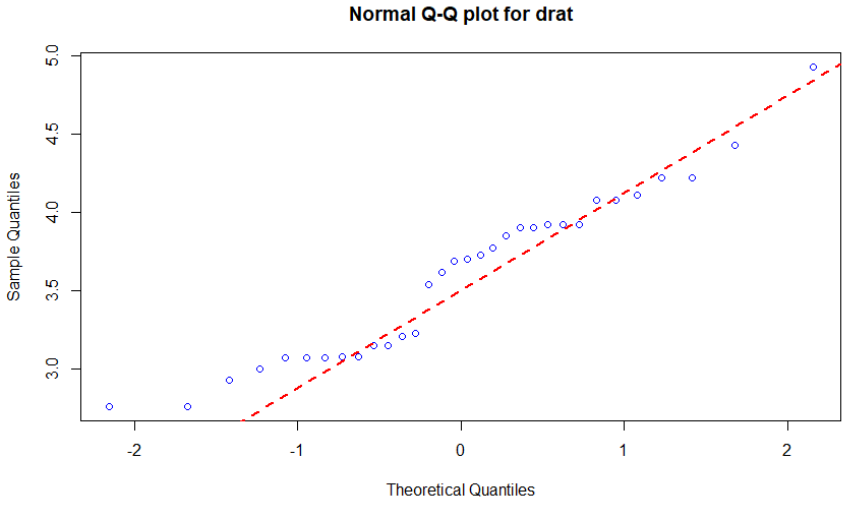
```r
# Q-Q plot for mtcars dataset
mt.num.cols <- mtcars2[sapply(mtcars2, is.numeric)]  # Getting only the numeric columns.
plotting.Q.Q <- function(df)
{
  for (column in colnames(df))
  {
    v <- unlist(df[column])

    qqnorm(v,
           main = paste("Normal Q-Q plot for", column),
           col = "blue")
    qqline(v, col = "red", lwd = 2, lty = 2)
  }
}

plotting.Q.Q(mt.num.cols)
```

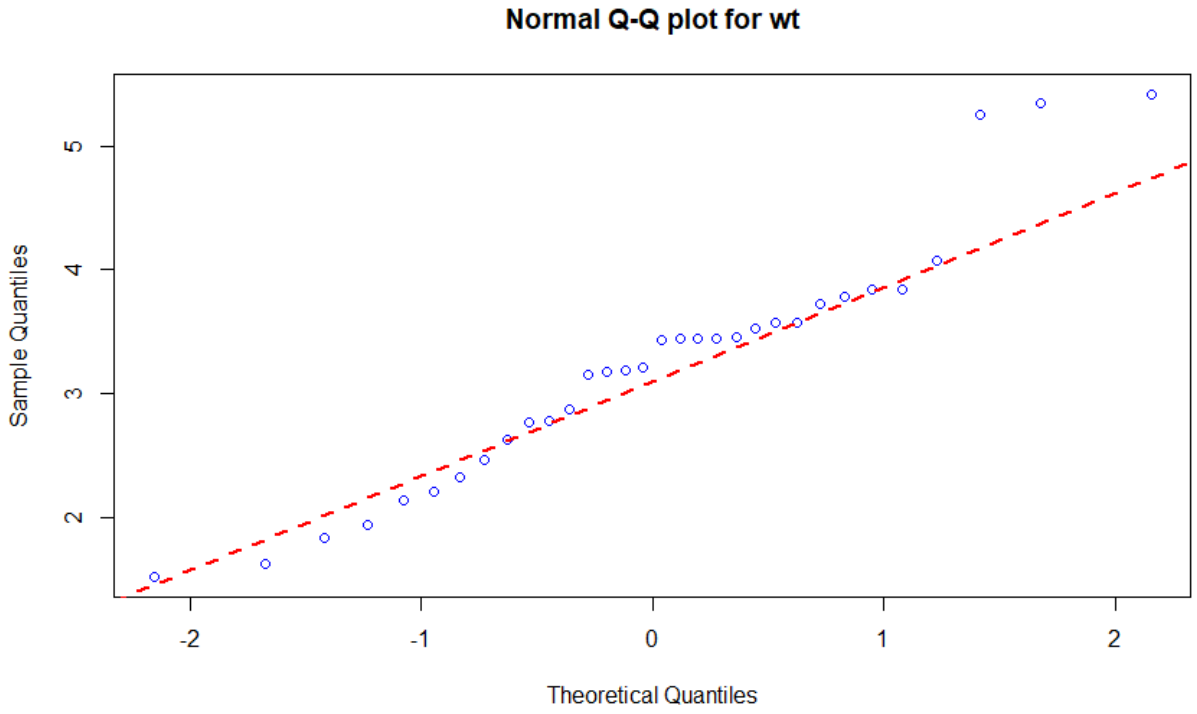
The output for the code:

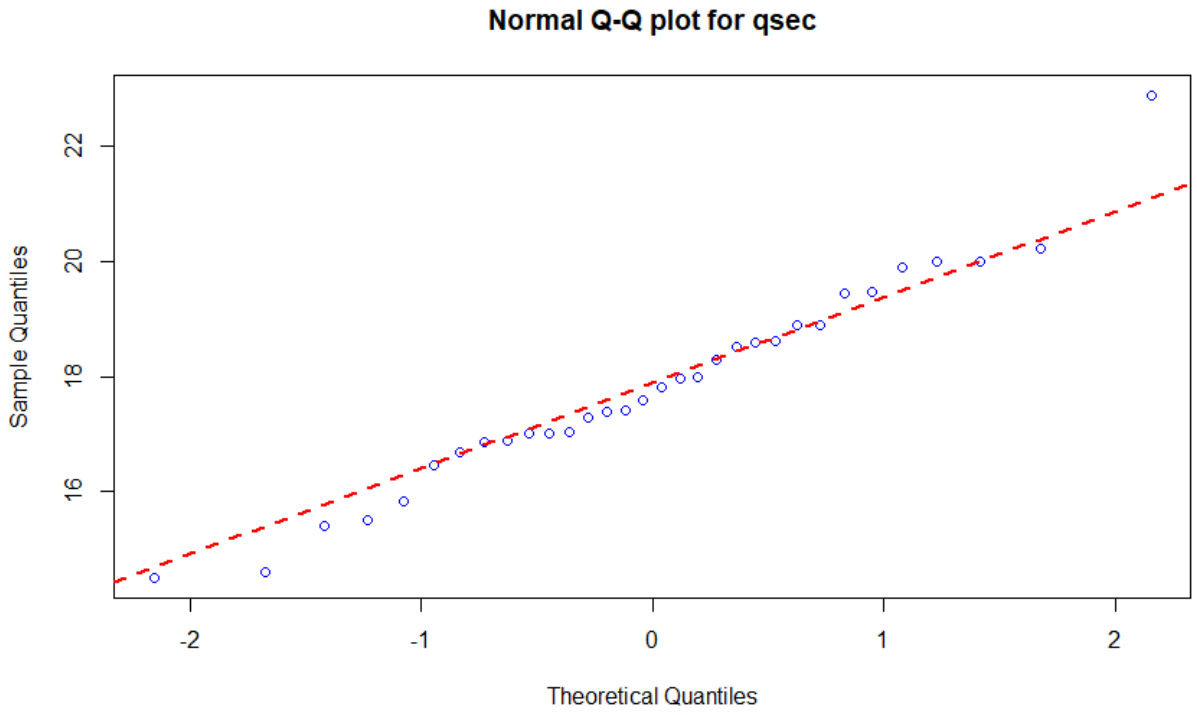

Normal Q-Q plot for mpg
Sample Quantiles
Theoretical Quantiles
10
15
20
25
30
-2
-1
0
1
2


Normal Q-Q plot for disp
Sample Quantiles
Theoretical Quantiles
100
200
300
400
-2
-1
0
1
2


Normal Q-Q plot for hp
Sample Quantiles
Theoretical Quantiles
50
100
150
200
250
300
-2
-1
0
1
2


Normal Q-Q plot for drat
Sample Quantiles
Theoretical Quantiles
3.0
3.5
4.0
4.5
5.0
-2
-1
0
1
2


Normal Q-Q plot for wt
Sample Quantiles
Theoretical Quantiles
2
3
4
5
-2
-1
0
1
2


Normal Q-Q plot for qsec
Sample Quantiles
Theoretical Quantiles
16
18
20
22
-2
-1
0
1
2

What did I deduce from the plots:

I kind of made tests on every numeric variable to see if this variable follows the normal distribution or not. The variable which fits to the red line follows the normal distribution. We can see that most of the variables in this dataset follow the normal distribution.