1. i) Describe how histogram charts are created in R. Create a histogram chart for the below given age attribute.

Age : 5,45,23,30,33,32,34,35,42,41,28,29

ii) Create a 3D Pie Chart for the dataset “political Knowledge” with suitable labels and colour.

CODE:

```
1)i)age <- c(5, 45, 23, 30, 33, 32, 34, 35, 42, 41, 28, 29)
hist(age, main = "Age Distribution", xlab = "Age", ylab = "Frequency")
ii)library(plotrix)
political_knowledge <- c("Low", "Low", "Medium", "Medium", "High", "High", "High")
pie3D(table(political_knowledge), main = "Political Knowledge",
     col = c("red", "orange", "green"), explode = 0.1)
```

2. Write R code for the below output Figure 1 shows Bike is assigned red , car is assigned yellow , bus is assigned blue , auto is assigned black , and train is assigned white. Mention the parameters used in the below barchart.

CODE:

```
data(mtcars)
boxplot(mpg ~ cyl, data = mtcars, xlab = "Number of Cylinders", ylab = "Miles per Gallon",
       main = "Relationship between MPG and Cylinders")
sum_natural <- function(n) {
 if (n == 0) {    # Base case: sum of 0 numbers is 0
  return(0)
 } else {    # Recursive case: sum of n numbers is n + sum of (n-1) numbers
  return(n + sum_natural(n-1))
 }
```

```
}
sum_natural(10)
```

Output:

55

3. Create a Boxplot graph for the relation between "mpg"(miles per galloon) and "cyl(number of Cylinders) for the dataset "mtcars" available in R Environment.

v)Write R program to find the sum of Natural Numbers using Recursion

CODE:

```
data(mtcars)
boxplot(mpg ~ cyl, data = mtcars, xlab = "Number of Cylinders", ylab = "Miles per Gallon",
        main = "Relationship between MPG and Cylinders")
sum_natural <- function(n) {
  if (n == 0) {    # Base case: sum of 0 numbers is 0
    return(0)
  } else {    # Recursive case: sum of n numbers is n + sum of (n-1) numbers
    return(n + sum_natural(n-1))
  }
}
sum_natural(10)    # Output: 55
```

4. a. Melt ‘airquality’ data set which inbuild dataset in ‘R’ and display as a long – format data?

b. Melt air quality data and specify month and day to be “ID variables”?

c. Cast the molten ‘airquality’ data set.

d. Use cast function appropriately and compute the average of Ozone, Solar, Wind and temperature per month?

e. Create a boxplot for ozone reading of ‘airquality’ dataset. Add title, label and color.

CODE:

4)a)

```
library(reshape2)

data(mtcars)
```

airquality_melt <- melt(airquality)

b)airquality_melt <- melt(airquality, id.vars = c("Month", "Day"))

head(airquality_melt)

c)airquality_cast <- dcast(airquality_melt, Month ~ variable)

head(airquality_cast)

d)library(plyr)

airquality_avg <- cast(airquality_melt, Month ~ variable, mean)

head(airquality_avg)

e)library(ggplot2)

```
ggplot(data = airquality, aes(x = "", y = Ozone)) +
  geom_boxplot(fill = "lightblue", color = "blue") +
  labs(title = "Boxplot of Ozone Readings", y = "Ozone Reading")
```

head(airquality_melt)

5. a. Write a program for creating a pie-chart in R using the input vector (21,62,10,53). Provide labels for the chart as ‘London’, ‘New York’, ‘Singapore’, ‘Mumbai’. Add a title to the chart as ‘city pie-chart’ and add a legend at the top right corner of the chart.

b. Using linear regression analysis establish a relationship between height and weight of a person using the input vector given below.

Values of height

151, 174, 138, 186, 128, 136, 179, 163, 152, 131

Values of weight.

63, 81, 56, 91, 47, 57, 76, 72, 62, 48 Predict the weight of a person with height 170.

c. Visualize the regression graphically.

d. Call ‘mtcars’ which is built in dataset in ‘R’ and plot distribution of mpg feature.

Make x axis range from 10 to 35 and plot title as “More trends in 70’s Vehicles”.

e. Find statistical summary of the ‘mtcars’ dataset.

CODE:

```
> input_vector <- c(21, 62, 10, 53)

> labels <- c("London", "New York", "Singapore", "Mumbai")

> pie(input_vector, labels = labels, main = "City Pie Chart")

> legend("topright", legend = labels, fill = rainbow(length(labels)))

> height <- c(151, 174, 138, 186, 128, 136, 179, 163, 152, 131)
> weight <- c(63, 81, 56, 91, 47, 57, 76, 72, 62, 48)

> fit <- lm(weight ~ height)

> predict(fit, data.frame(height = 170))       1
76.22869
plot(height, weight, main = "Height vs Weight")


> abline(fit, col = "red")


> hist(mtcars$mpg, xlim = x_range, main = "More Trends in 70's Vehicles", xlab = "MPG")

> e)summary(mtcars)
```

6. There is a popular built-in data set in R called "mtcars" (Motor Trend Car Road Tests),

which is retrieved from the 1974 Motor Trend US Magazine.

(i)Find the dimension of the data set & Give the statistical summary of the features.

(ii)Create correlation matrix between mpg vs all other features and print the high 3

correlated Features(both +ve and -ve)

(iii)Plot the Box plot for “mpg” group by “cyl” feature.

(iv)Create a scatter plot graph for the relation between "mpg"(miles per gallon) and

"hp"(horse power) group by cyl(number ofcylinder)

Sample Output:

(v) Generate a multiple regression model to establish the relationship between "mpg"

as a response variable with "disp","hp" and "wt" as predictor variables. Plot the

regression line. Find the MSE of the model.

CODE:

```
data(mtcars)
> dim(mtcars)
[1] 32 11
> 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              ge
ar
 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
> correlations <- cor(mtcars)

> correlations_sorted <- sort(abs(correlations[,'mpg']), decreasing = TRUE
)

> correlations_sorted[1:3]      mpg        wt       cyl
1.0000000 0.8676594 0.8521620
```

7. (i) Use melt and cast function to find mean of numeric data in dataset based on

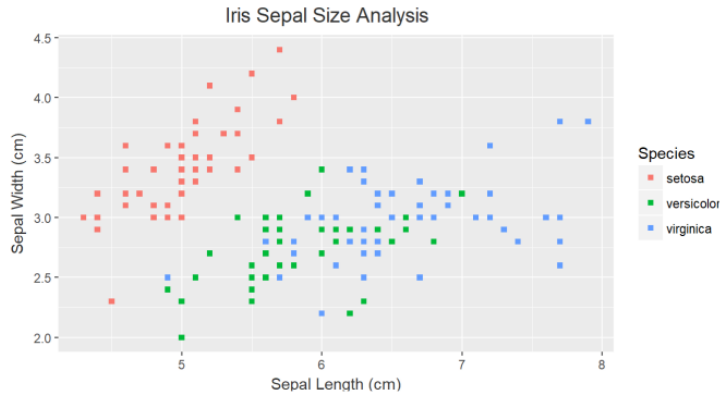
Species group.

(ii) Generate a suitable plot which summaries statistical parameter of Sepal.Width

based on Species group

(iii) Generate scatter plot between Sepal.Length vs Sepal.Width grouped by Specias.

Sample Output:



CODE:

7)a)# Load the reshape2 package

```
library(reshape2)

# Melt the iris data set
melted_iris <- melt(iris, id.vars = 'Species')

# Cast the molten data set to find the mean of the numeric variables based on the species group
mean_iris <- dcast(melted_iris, Species ~ variable, mean)

# View the mean_iris data frame
mean_iris
```

b)# Load the ggplot2 package

```
library(ggplot2)

# Create a box plot of Sepal.Width grouped by Species
ggplot(iris, aes(x = Species, y = Sepal.Width)) +
  geom_boxplot() +
  ggtitle("Box plot of Sepal.Width by Species")
```

c)# Create a scatter plot of Sepal.Length vs Sepal.Width grouped by Species

```
ggplot(iris, aes(x = Sepal.Length, y = Sepal.Width, color = Species)) +
  geom_point() +
  ggtitle("Scatter plot of Sepal.Length vs Sepal.Width by Species")
```

8. A) Heights(in cm) of father and son are given as follows

Father(X): 150 152 155 157 160 161 164 165

Son (Y) : 154 156 158 159 160 162 161 164

Fit a regression line parameters to predict the height of son given the height of father.

Write R code for same.

B) Fit a regression line parameters distribution with the following data

X	0	1	2	3	4	5
Y	142	156	69	27	5	1

CODE:

```
father_height <- c(150, 152, 155, 157, 160, 161, 164, 165)

son_height <- c(154, 156, 158, 159, 160, 162, 161, 164)

regression_model <- lm(son_height ~ father_height)

summary(regression_model)
```

B)# Fit a regression line to the data

```
regression_model <- lm(y ~ x, data = data_df)

summary(regression_model)
```