Experiment No. 8

Objective: Exercises to draw a scatter diagram, residual plots, outliers leverage and influential data points in R

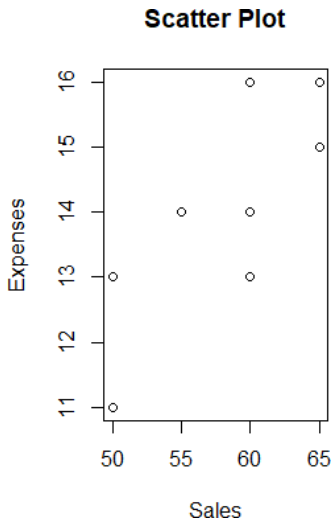
Theory and Technique:

Scatter Plot - A scatter plot is a set of dotted points representing individual data pieces on the horizontal and vertical axis. In a graph in which the values of two variables are plotted along the X-axis and Y-axis, the pattern of the resulting points reveals a correlation between them.

Scatter plot in R Programming Language using the plot() function.
Syntax: plot(x, y, main, xlab, ylab, xlim, ylim, axes),

Code:

```
x = c(50,50,55,60,65,65,65,60,60,50)
y=c(11,13,14,16,16,15,15,14,13,13)
plot(x,y,main="Scatter Plot",xlab="Sales",ylab="Expenses")
```

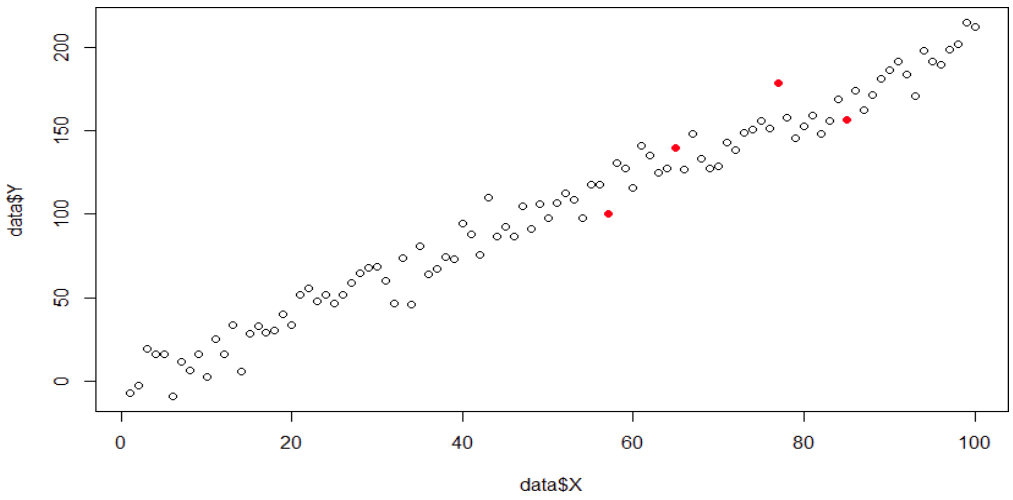


Residual plots are often used to assess whether or not the residuals in regression analysis are normally distributed and whether or not they exhibit heteroscedasticity.

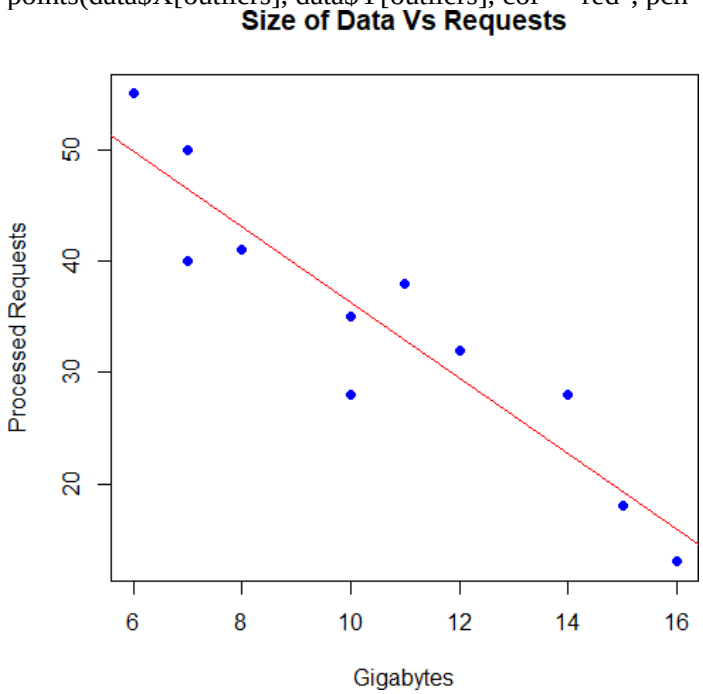
Code:

```
x = c(6,7,7,8,10,10,11,12,14,15,16)
y=c(55,40,50,41,35,28,38,32,28,18,13)
mod=lm(y~x) summary(mod)
```

plot(x,y,main="Size of Data Vs Requests", xlab="Gigabytes", ylab="Processed Requests",pch=16, col="blue")
abline(a=70.16, -3.39, col="red");



Outliers: Outliers are the points that are distinct and deviant from the bulk of the dataset. In general, the outliers have **high residual** values means that the difference is greater than the b/w observed and predicted value.
Code:
data <- data.frame(x,y) plot(data$x, data$y)
# Example: Detecting outliers
# Identify observations with high residuals
outliers <- which(abs(resid(mod)) > 2 * sd(resid(mod))) X <- 1:100
Y <- 2 * X + rnorm(100, mean = 0, sd = 10) model <- lm(Y ~ X, data = data)
data <- data.frame(X = 1:100, Y = 2 * X + rnorm(100, mean = 0, sd = 10)) outliers <- which(abs(resid(model)) > 2 * sd(resid(model)))
plot(data$X, data$Y)
points(data$X[outliers], data$Y[outliers], col = "red", pch = 19)



Influential Points:
An influential point is a point that has a large impact on the regression. Surprisingly, these are not the same thing. A point can be an outlier without being influential. A point can be influential without being an outlier. A point can be both or neither

Code:

```
influential <- cooks.distance(mode threshold <- 3 / length(data$X)
influential_obs <- which(influential > threshold)

# Highlight influential observations in the scatterplot plot(data$X, data$Y)
points(data$X[influential_obs], data$Y[influential_obs], col = "orange", pch = 19)
```