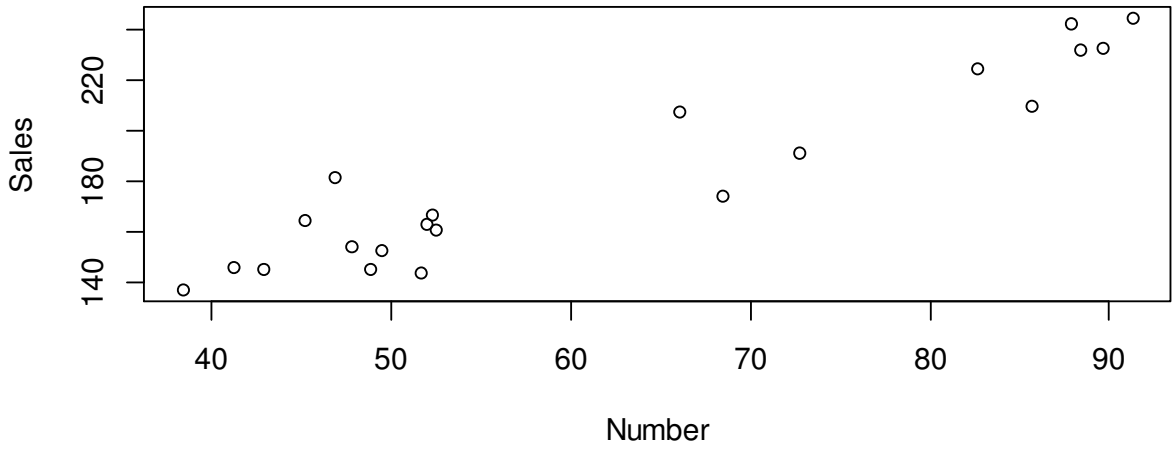
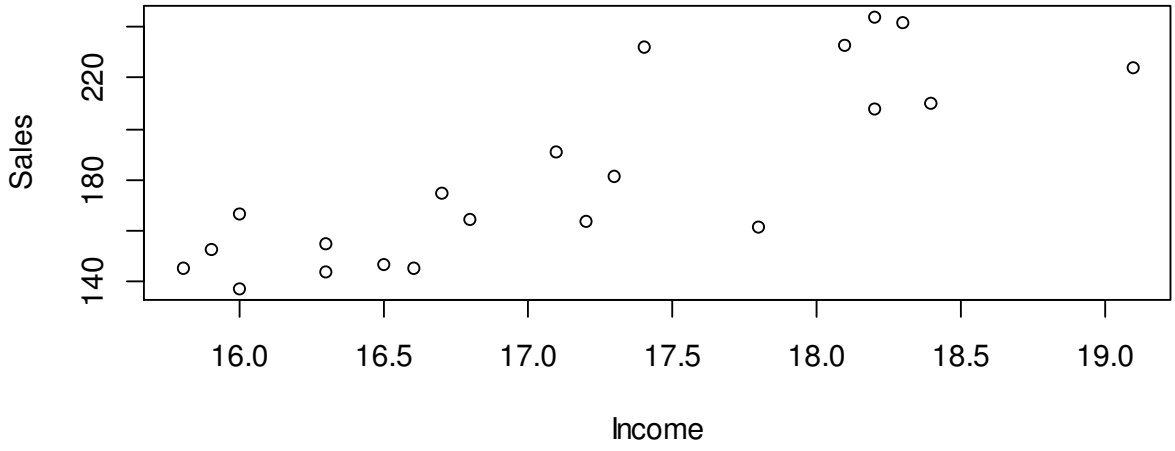
```
# R code for Dwaine Studio example p236
sales=read.table("C:/Users/Mihinda/Desktop/dwaine.txt", header=1)
sales

par(mfrow=c(2,1))
plot(sales$number,sales$sales, xlab="Number", ylab="Sales")
plot(sales$income,sales$sales, xlab="Income", ylab="Sales")

fit <- lm(sales ~ number + income, data=sales)
summary(fit) # show results
anova(fit)
par(mfrow=c(2,1))
plot(fitted(fit),residuals(fit))
qqnorm(residuals(fit))
# Other useful functions
coefficients(fit) # model coefficients
confint(fit, level=0.95) # CIs for model parameters
vcov(fit) # covariance matrix for model parameters

#prdicting EY at a given value x0
x0=data.frame(number=60, income=16)
predict(fit, x0)
#CI for the mean of Y at x=x0
predict(fit, x0, interval="confidence", level=0.95)
# prediction interval for a new Y at x = x0
predict(fit, x0, interval="prediction", level=0.95)

# Check Type I SS on R ANOVA
fit1 <- lm(sales ~ number , data=sales)
anova(fit1)
```

R Output

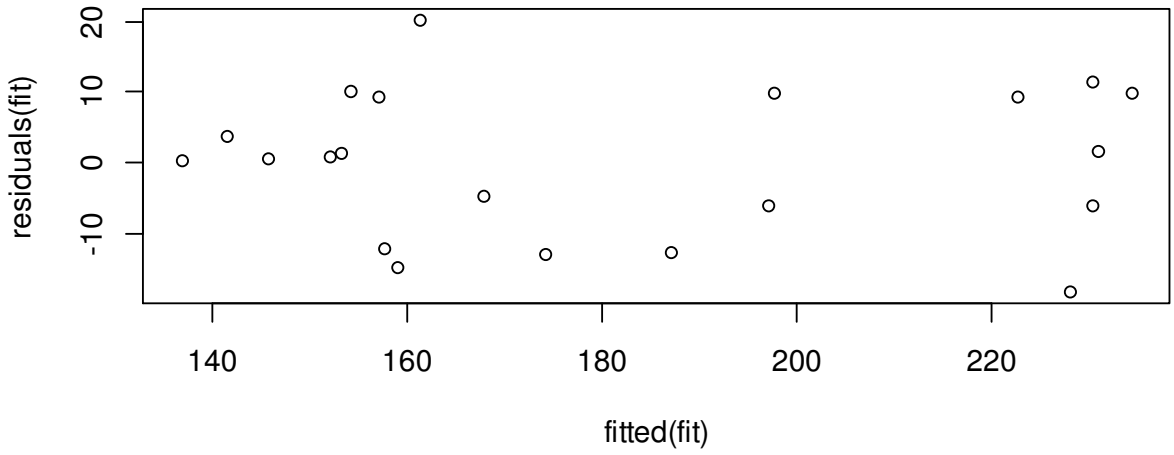
```
> # R code for Dwaine Studio example p236
> sales=read.table("C:/Users/Mihinda/Desktop/dwaine.txt",
header=1) #the data file
> sales
   Row number income sales
1    1   68.5   16.7 174.4
2    2   45.2   16.8 164.4
3    3   91.3   18.2 244.2
4    4   47.8   16.3 154.6
5    5   46.9   17.3 181.6
6    6   66.1   18.2 207.5
7    7   49.5   15.9 152.8
8    8   52.0   17.2 163.2
9    9   48.9   16.6 145.4
10  10   38.4   16.0 137.2
11  11   87.9   18.3 241.9
12  12   72.8   17.1 191.1
13  13   88.4   17.4 232.0
14  14   42.9   15.8 145.3
15  15   52.5   17.8 161.1
16  16   85.7   18.4 209.7
17  17   41.3   16.5 146.4
18  18   51.7   16.3 144.0
19  19   89.6   18.1 232.6
20  20   82.7   19.1 224.1
21  21   52.3   16.0 166.5
>
> par(mfrow=c(2,1))
> plot(sales$number,sales$sales, xlab="Number", ylab="Sales")
> plot(sales$income,sales$sales, xlab="Income", ylab="Sales")
```

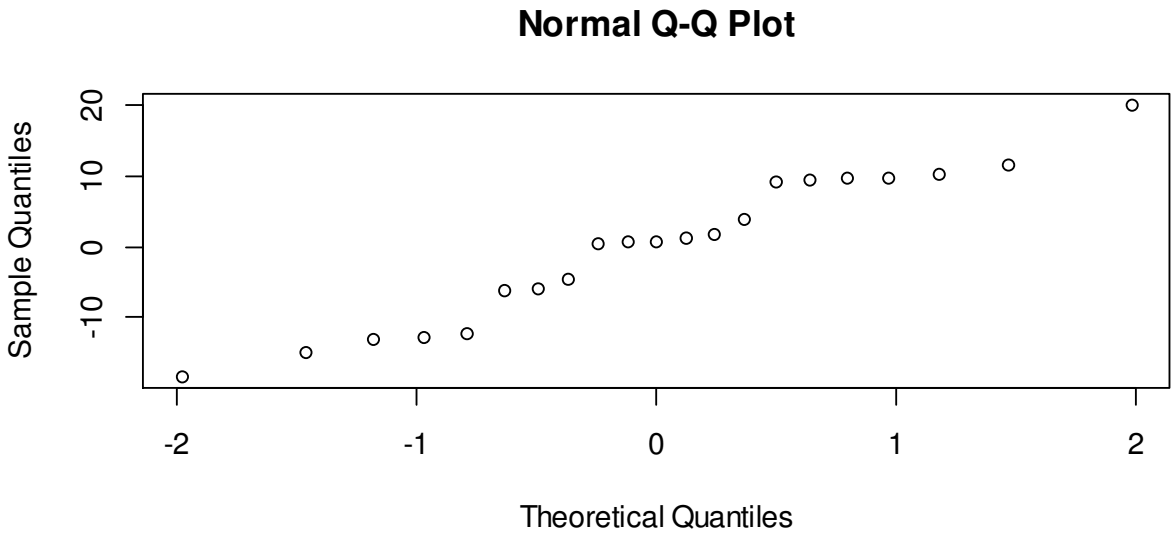





```
> fit <- lm(sales ~ number + income, data=sales)
> summary(fit) # show results

Call:
lm(formula = sales ~ number + income, data = sales)

Residuals:
     Min       1Q   Median       3Q      Max
-18.4239  -6.2161   0.7449   9.4356  20.2151
```

```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) -68.8571    60.0170  -1.147   0.2663
number        1.4546     0.2118   6.868    2e-06 ***
income        9.3655     4.0640   2.305   0.0333 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 11.01 on 18 degrees of freedom
Multiple R-squared: 0.9167,     Adjusted R-squared: 0.9075
F-statistic:  99.1 on 2 and 18 DF,  p-value: 1.921e-10

> anova(fit)
Analysis of Variance Table

Response: sales
          Df  Sum Sq Mean Sq  F value   Pr(>F)
number     1 23371.8 23371.8 192.8962 4.64e-11 ***
income     1   643.5   643.5   5.3108  0.03332 *
Residuals 18  2180.9   121.2
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
> par(mfrow=c(2,1))
> plot(fitted(fit),residuals(fit))
> qqnorm(residuals(fit))
```






```
> # Other useful functions
> coefficients(fit) # model coefficients
(Intercept)      number      income
  -68.85707     1.45456     9.36550
> confint(fit, level=0.95) # CIs for model parameters
                    2.5 %    97.5 %
(Intercept) -194.9480130 57.233867
number         1.0096226  1.899497
income         0.8274411 17.903560
```

```
> vcov(fit) # covariance matrix for model parameters

            (Intercept)      number       income
(Intercept)  3602.03467  8.74593958 -241.4229923
number          8.74594  0.04485151   -0.6724426
income       -241.42299 -0.67244260   16.5157558
>
> #prdicting EY at a given value x0
> x0=data.frame(number=60, income=16)
> predict(fit, x0)
       1
168.2645
> #CI for the mean of Y at x=x0
> predict(fit, x0, interval="confidence", level=0.95)
       fit      lwr      upr
1 168.2645 157.8823 178.6467
> # prediction interval for a new Y at x = x0
> predict(fit, x0, interval="prediction", level=0.95)
       fit      lwr      upr
1 168.2645 142.9152 193.6138
>

> # Check Type I SS on R ANOVA
> fit1 <- lm(sales ~ number , data=sales)
> anova(fit1)
Analysis of Variance Table

Response: sales
          Df  Sum Sq Mean Sq F value    Pr(>F)
number     1 23371.8 23371.8  157.22 1.229e-10 ***
Residuals 19  2824.4   148.7
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
>
```