Assignment 1

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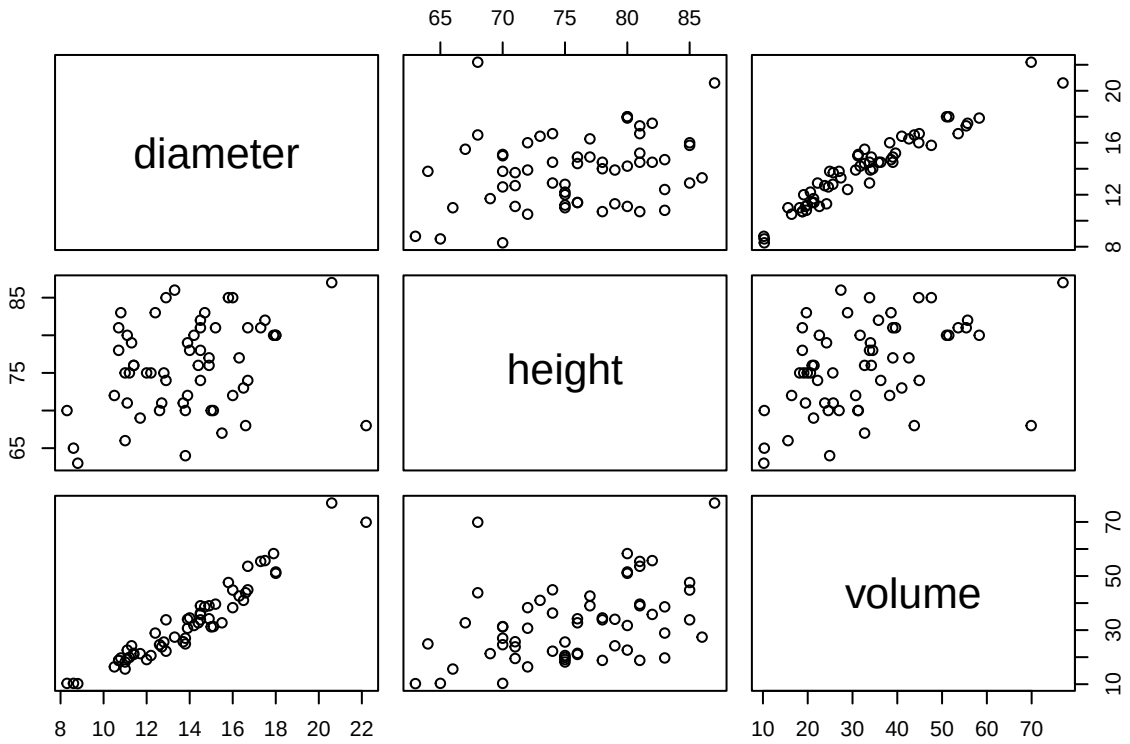
Exercise 1

a)

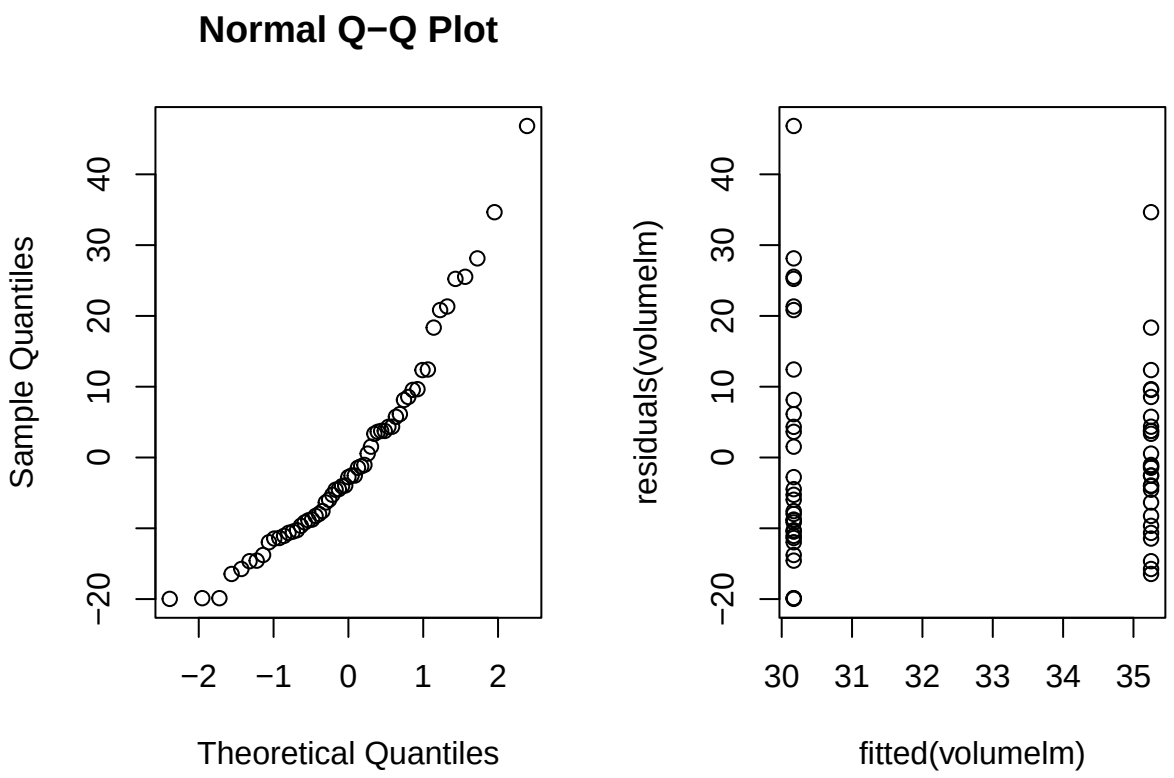
```
treeVolume = read.table("treeVolume.txt", header = T)
head(treeVolume)
```

```
pairs(treeVolume[,1:3])
```



Since P value for type is 0.1736, it indicates that we fail to reject the null hypothesis and conclude that there is no significant difference in mean volume between the beech and oak trees.

```
par(mfrow=c(1,2))
qqnorm(residuals(volumelm))
plot(fitted(volumelm), residuals(volumelm))
```




```
par(mfrow=c(1,1))
```

After testing the data for normality, it becomes obvious that there is a deviation of residuals from the normal distribution. As ANOVA assumptions have been violated, p-value may not be reliable.

```
t.test(volume ~ factor(type), data=treeVolume)
```

T-test shows the p-value 0.1659, indicating that we do not reject a null hypothesis. That indicated the difference in means between volumes of beech and oak is different.

T-test also displays estimates of mean for group beech (30.17097) and oak (35.25000)

b)

```
## Analysis of Variance Table
##
## Response: volume
```

```
##                                Df Sum Sq Mean Sq F value    Pr(>F)
## factor(height)                 23 7946.9  345.52 3370.90 0.0002966 ***
## factor(type)                    1  315.4  315.42 3077.26 0.0003248 ***
## factor(diameter)               31 3490.9  112.61 1098.63 0.0009098 ***
## factor(type):factor(diameter)   1   20.9   20.91  203.97 0.0048670 **
## Residuals                       2    0.2    0.10
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
volumeFulllm2 = lm(volume ~ factor(diameter) + factor(type) * factor(height), data = treeVolume
anova(volumeFulllm2)
```

```
## Analysis of Variance Table
##
## Response: volume
##                              Df  Sum Sq Mean Sq  F value    Pr(>F)
## factor(diameter)             44 11606.8 263.790 2573.559 0.0003885 ***
## factor(type)                  1     2.6   2.602   25.386 0.0372075 *
## factor(height)               10   143.9  14.386  140.355 0.0070944 **
## factor(type):factor(height)   1    20.9  20.907  203.968 0.0048670 **
## Residuals                     2     0.2   0.102
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

c)

d)

Exercise 2

a)

b)

c)

d)

Exercise 3

a)

b)

c)

d)

e)

Exercise 4

a)

b)

c)