# ANEXO I

```
########  Pergunta 1  e 2  ########

> concentracao<-read.table("dados_6var.txt",header=TRUE,dec=".",sep="",as.is=TRUE,na.strings=NA)
> head(concentracao)
  Mes    K    NA.   CA    CL
1   9  0.52  2.18  3.36  0.79
2  10  0.46  1.94  3.10  0.87
3  12  0.30  1.36  2.21  0.76
4   2  0.32  1.42  2.45  0.76
5   3  0.30  1.35  2.28  0.71
6   8  0.51  2.06  3.18  0.61
> attach(concentracao)
> dim(concentracao)
[1] 260   5

> table(Mes)
Mes
 1  2  3  4  5  6  7  8  9 10 11 12
24 25 26 20 21 14 17 22 23 21 22 25

> boxplot(CA~Mes)

> by(CA,Mes,summary)
Mes: 1
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.030   3.140   3.470   3.421   3.857   4.350
------------------------------------------------------------
Mes: 2
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.120   3.100   3.550   3.482   3.890   4.570
------------------------------------------------------------
Mes: 3
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.080   3.123   3.645   3.596   4.087   4.670
------------------------------------------------------------
Mes: 4
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.160   3.515   4.085   3.955   4.512   5.340
------------------------------------------------------------
Mes: 5
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.120   3.550   4.090   4.069   4.700   5.720
------------------------------------------------------------
Mes: 6
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.430   3.772   4.225   4.412   4.995   6.630
------------------------------------------------------------
Mes: 7
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.110   4.350   4.740   5.306   7.050   7.630
------------------------------------------------------------
Mes: 8
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  3.180   4.535   5.005   5.516   7.230   8.130
------------------------------------------------------------
Mes: 9
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.970   4.330   5.060   5.382   6.975   8.360
------------------------------------------------------------
Mes: 10
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
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  2.790   4.210   4.800   5.081   5.930   8.090
------------------------------------------------------------
Mes: 11
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.460   3.842   4.190   4.259   4.825   6.640
------------------------------------------------------------
Mes: 12
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  2.050   3.070   3.420   3.371   3.820   4.430


> (CA5<-CA[Mes==5])
 [1] 2.49 2.12 2.28 4.70 4.94 3.45 3.55 3.63 4.00 4.02 4.24 4.09 4.27 4.14 3.55
[16] 3.75 5.47 5.72 5.29 5.08 4.66

> shapiro.test(CA5)

        Shapiro-Wilk normality test

data:  CA5
W = 0.9599, p-value = 0.5133

> (CA10<-CA[Mes==10])
 [1] 3.10 3.25 2.79 5.56 4.85 4.80 4.21 4.03 4.16 5.35 5.03 4.45 4.52 4.58 4.34
[16] 6.65 6.80 6.38 8.09 7.84 5.93
> shapiro.test(CA10)

        Shapiro-Wilk normality test

data:  CA10
W = 0.9541, p-value = 0.4063

> shapiro.test(CA5-CA10)

        Shapiro-Wilk normality test

data:  CA5 - CA10
W = 0.8415, p-value = 0.003044


> var.test(CA5,CA10)

        F test to compare two variances

data:  CA5 and CA10
F = 0.4678, num df = 20, denom df = 20, p-value = 0.09728
alternative hypothesis: true ratio of variances is not equal to 1
95 percent confidence interval:
 0.1898337 1.1529896
sample estimates:
ratio of variances
         0.4678421

> t.test(CA5,CA10)

        Welch Two Sample t-test

data:  CA5 and CA10
t = -2.6539, df = 35.353, p-value = 0.01185
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.7873756 -0.2383387
sample estimates:
mean of x mean of y
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```
 4.068571  5.081429


> t.test(CA5,CA10,paired=TRUE)

        Paired t-test

data:  CA5 and CA10
t = -5.4241, df = 20, p-value = 2.613e-05
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.4023722 -0.6233421
sample estimates:
mean of the differences
              -1.012857


> t.test(CA5,CA10,var.equal=TRUE)

        Two Sample t-test

data:  CA5 and CA10
t = -2.6539, df = 40, p-value = 0.01136
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.7842049 -0.2415094
sample estimates:
mean of x mean of y
 4.068571  5.081429

> t.test(CA5,CA10,var.equal=TRUE, alternative="less")

        Two Sample t-test

data:  CA5 and CA10
t = -2.6539, df = 40, p-value = 0.005681
alternative hypothesis: true difference in means is less than 0
95 percent confidence interval:
       -Inf -0.3702118
sample estimates:
mean of x mean of y
 4.068571  5.081429


> library(fBasics)
> basicStats(CA)
                     CA
nobs         260.000000
NAs            0.000000
Minimum        2.030000
Maximum        8.360000
1. Quartile    3.445000
3. Quartile    4.720000
Mean           4.265462
Median         4.055000
Sum         1109.020000
SE Mean        0.082224
LCL Mean       4.103549
UCL Mean       4.427374
Variance       1.757795
Stdev          1.325819
Skewness       0.996276
Kurtosis       0.899023
```