```
library(tidyverse)
f=file.choose()
fullBumpus=read_table(f)
```

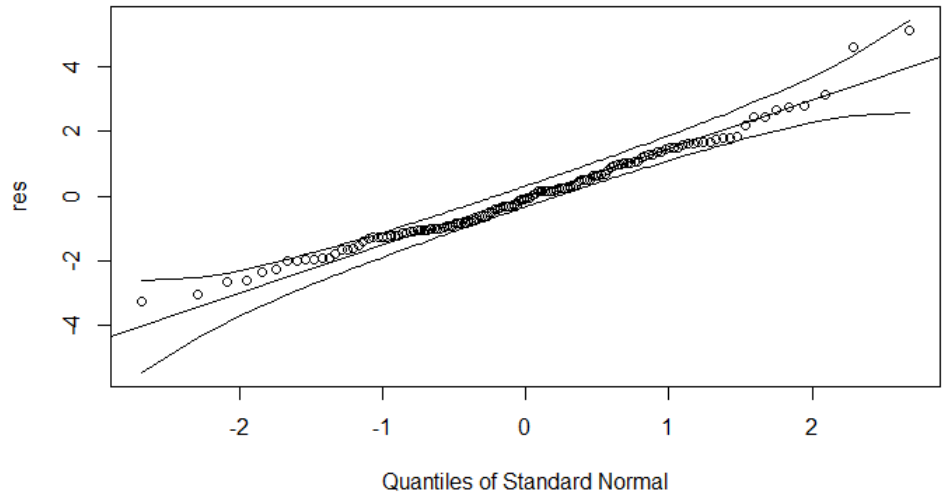
1.

a)

```
> with(fullBumpus,t.test(Weight[Survive==1],
+                        Weight[Survive==0],
+                        var.equal=TRUE))

        Two Sample t-test

data:  Weight[Survive == 1] and Weight[Survive == 0]
t = -2.6093, df = 134, p-value = 0.0101
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.1399459 -0.1569291
sample estimates:
mean of x mean of y
 25.21250  25.86094

> with(fullBumpus,t.test(Weight[Survive==1],
+                        Weight[Survive==0],
+                        var.equal=FALSE))

        Welch Two Sample t-test

data:  Weight[Survive == 1] and Weight[Survive == 0]
t = -2.5703, df = 117.95, p-value = 0.01141
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -1.1480287 -0.1488463
sample estimates:
mean of x mean of y
 25.21250  25.86094
```

b)

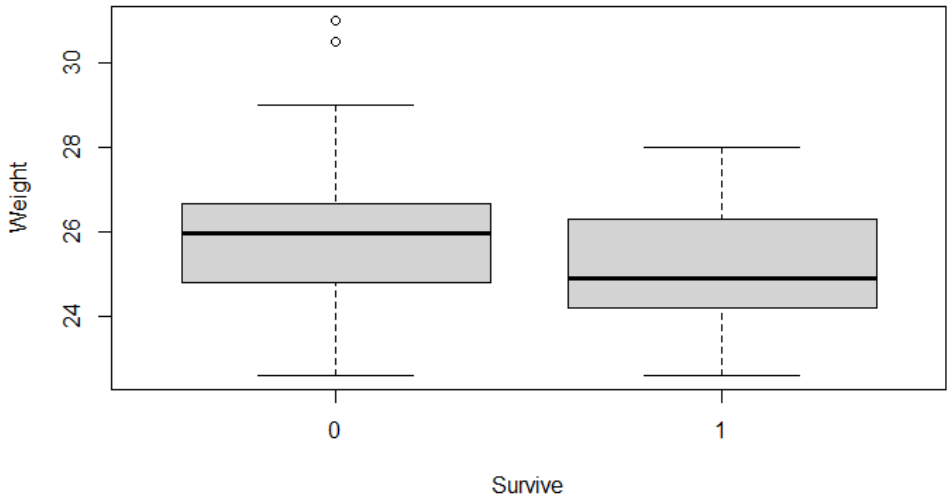
```
res = resid(lm(Weight~Survive, fullBumpus))
source("http://www.stat.cmu.edu/~hseltman/files/qqn.R")
qqn(res)
```



Nonnormality is not an issue here

c)

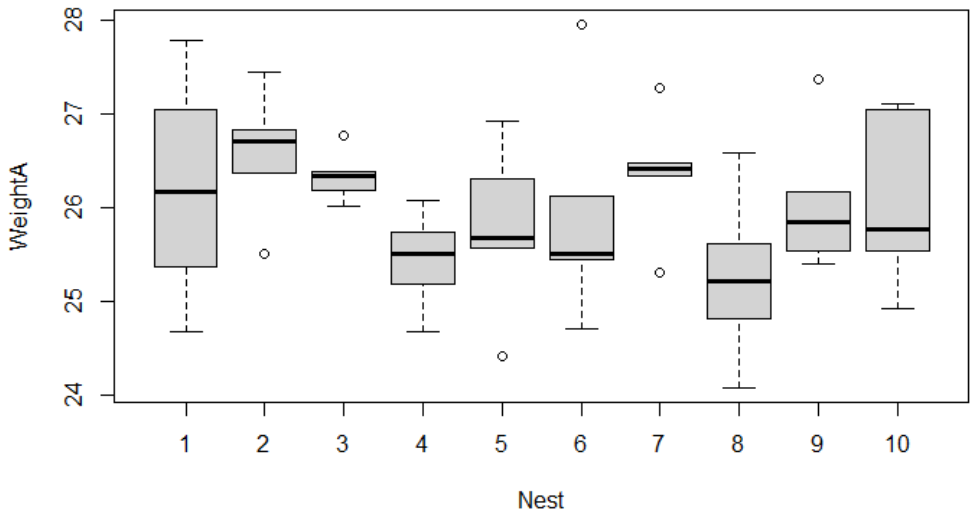
```
with(fullBumpus, boxplot(Weight~Survive))
```

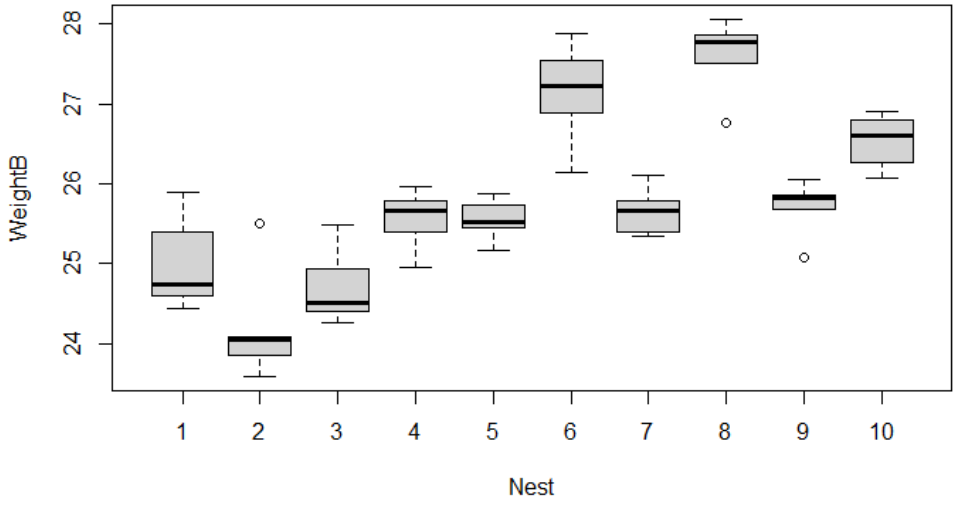


Ratio is pretty close to each other (1:1)

d)

```
f=file.choose()
FakeCor=read_table(f)
with(FakeCor, boxplot(WeightA~Nest))
with(FakeCor, boxplot(WeightB~Nest))
```





2.

a)

```
mdl = lm(Alar~Female+Weight, data=fullBumpus)
summary(mdl)
Call:
lm(formula = Alar ~ Female + Weight, data = fullBumpus)

Residuals:
    Min      1Q  Median      3Q     Max
-13.2387  -2.6125   0.2613   2.8729  11.0747
```

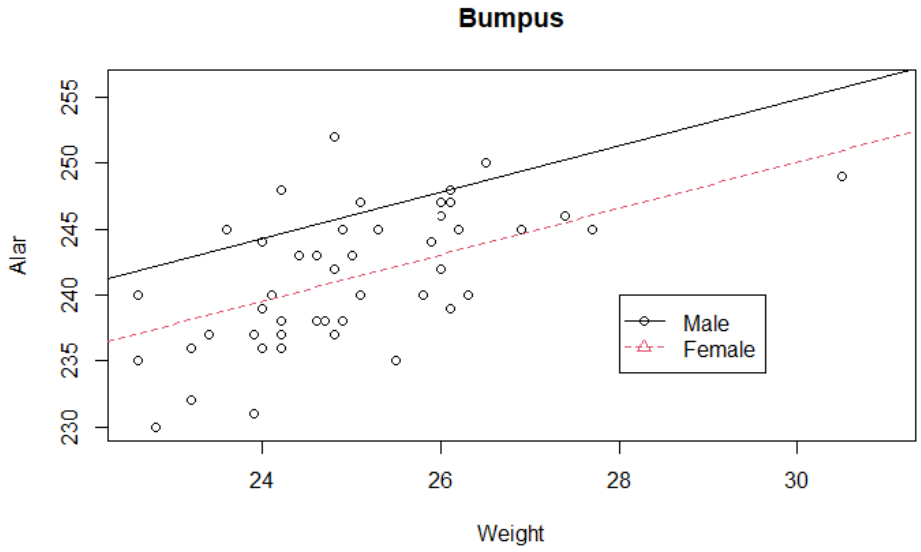
```
Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept) 202.1958     6.1318  32.975  < 2e-16 ***
Female       -4.8027     0.7271  -6.605 8.71e-10 ***
Weight        1.7553     0.2372   7.401 1.37e-11 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.942 on 133 degrees of freedom
Multiple R-squared:  0.4961,  Adjusted R-squared:  0.4885
F-statistic: 65.47 on 2 and 133 DF,  p-value: < 2.2e-16
```

b)

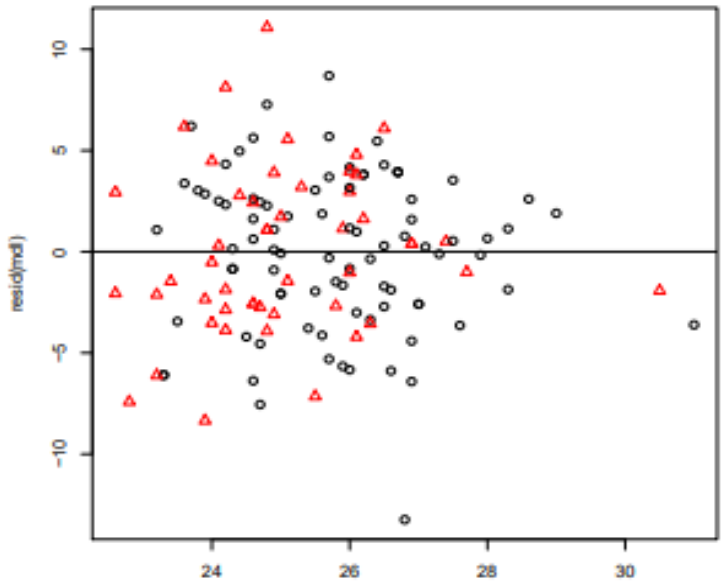
```
> b0M
(Intercept)
  202.1958
> b0F = mdl$coefficients[1] + mdl$coefficients[2]
> b0F
(Intercept)
  197.3931
> b1 = mdl$coefficients[3]
> b1
 Weight
1.75533
```

c)

```
with(fullBumpus, table(Female, as.numeric(Female)))
with(fullBumpus, plot(Alar~Weight, pch=as.numeric(Female),
                col=as.numeric(Female), main="Bumpus"))
abline(b0M, b1, col=1, lty=1)
abline(b0F, b1, col=2, lty=2)
legend(28, 240, c("Male", "Female"), col=1:2, lty=1:2, pch=1:2)
```



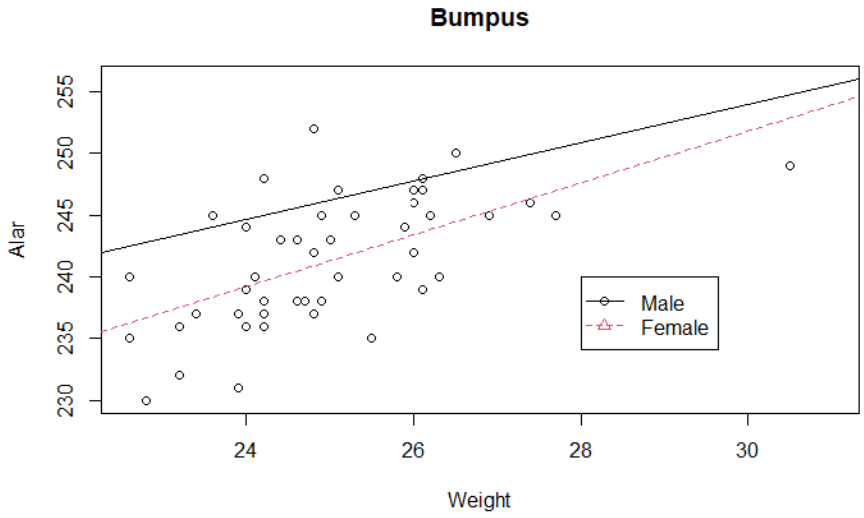

```
with(fullBumpus, plot(resid(mdl)~fullBumpus$Weight, col=as.numeric(fullBumpus$Female),
    pch=as.numeric(fullBumpus$Female)))
abline(h=0)
```



d)

```
 mdlI = lm(Alar~Female*Weight, data=fullBumpus)
> summary(mdlI)

Call:
lm(formula = Alar ~ Female * Weight, data = fullBumpus)

Residuals:
```

```
    Min       1Q   Median       3Q      Max
-13.0332  -2.5531   0.0527   2.8415  11.1550

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)   207.4608     7.6956  26.958  < 2e-16 ***
Female        -18.8586    12.4580  -1.514    0.132
Weight          1.5512     0.2979   5.207 7.18e-07 ***
Female:Weight   0.5554     0.4914   1.130    0.260
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 3.938 on 132 degrees of freedom
Multiple R-squared:  0.5009,  Adjusted R-squared:  0.4896
F-statistic: 44.16 on 3 and 132 DF,  p-value: < 2.2e-16

> b0M = mdlI$coefficients[1]
> b0M
(Intercept)
  207.4608
> b0F = mdlI$coefficients[1] + mdlI$coefficients[2]
> b0F
(Intercept)
  188.6022
> b1M = mdlI$coefficients[3]
> b1M
  Weight
1.551208
> b1F = mdlI$coefficients[3] + mdlI$coefficients[4]
> b1F
  Weight
2.106566
> with(fullBumpus, plot(Alar~Weight, pch=as.numeric(Female),
+                       col=as.numeric(Female), main="Bumpus"))
> abline(b0M, b1M, col=1, lty=1)
> abline(b0F, b1F, col=2, lty=2)
> legend(28, 240, c("Male", "Female"), col=1:2, lty=1:2, pch=1:2)
```



e)

```
> anova(mdl,mdII)
Analysis of Variance Table

Model 1: Alar ~ Female + Weight
Model 2: Alar ~ Female * Weight
  Res.Df    RSS Df Sum of Sq      F Pr(>F)
1    133 2067.1
2    132 2047.3  1     19.81 1.2773 0.2605
```

Do NOT have sufficient evidence

f)

```
confint(mdII)
                   2.5 %     97.5 %
(Intercept)   192.2381377 222.683434
Female        -43.5018377   5.784645
Weight          0.9619145   2.140502
Female:Weight  -0.4166585   1.527374
```