Q5

Comments

a)correct.

b)correct.

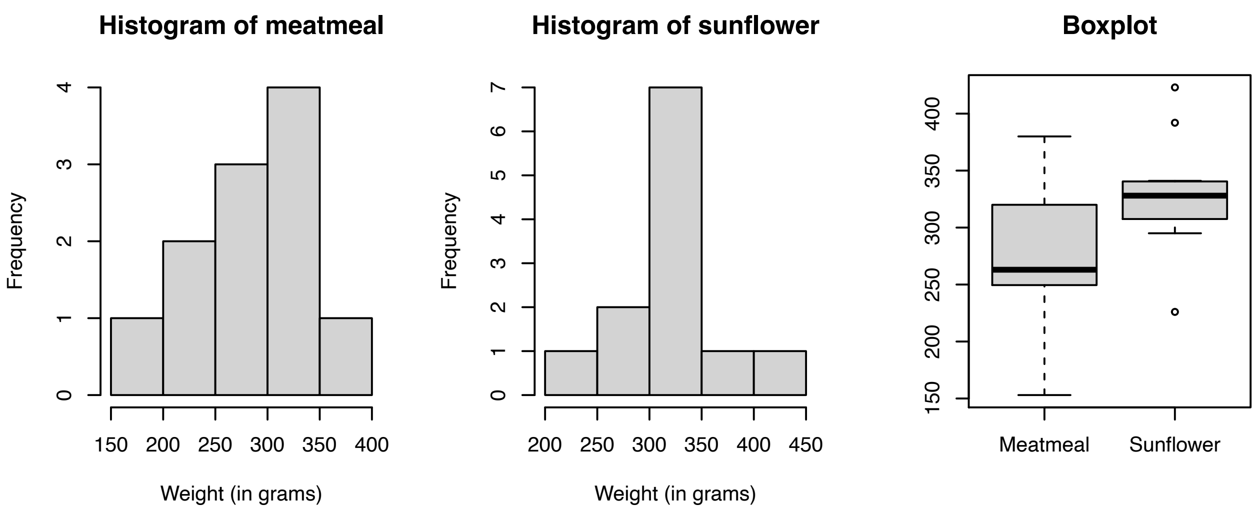
c)Very good for also checking the variance even not necessary here.

d)correct

2 / 2 pts

Exercise 5 - Chick Weights

a) Meatmeal and Sunflower



As shown in the boxplot the chicks that get the sunflower (M=329) supplement seem to weigh more than the chicks that get the meatmeal (M=277) supplement. To test whether this result is significant a t-test, Mann-Withney and Kolmogorov-Smirnov test are executed. Since the chicks are divided between groups and the difference between the groups is tested, a two independent samples t-test will be used. The t-test showed that there is a difference between the `meatmeal` and the `sunflower` groups ($t(18)$ = -2.2, $p < .05$).

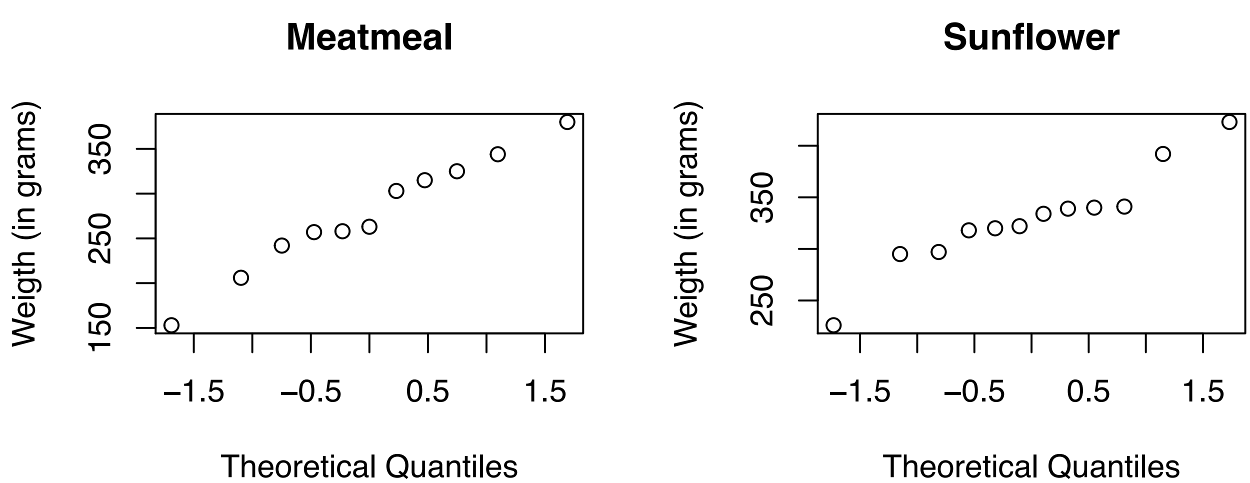
```
t.test(meatmeal, sunflower)
##
##  Welch Two Sample t-test
##
## data:  meatmeal and sunflower
## t = -2, df = 19, p-value = 0.04
```

```
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -102.57   -1.44
## sample estimates:
## mean of x mean of y
##       277       329
```

Whether we can trust this result depends on whether the assumption of normality is met. The Mann-Withney and Kolmogorov-Smirnov test do not assume normality of the data and both the Mann-Withney (W = *36*, $p > .05$) and Kolmogorov-Smirnov (D = *0.5*, $p > .05$) test show no difference in distribution between the groups.

```
wilcox.test(meatmeal, sunflower)
##
##  Wilcoxon rank sum exact test
##
## data:  meatmeal and sunflower
## W = 36, p-value = 0.07
## alternative hypothesis: true location shift is not equal to 0
ks.test(meatmeal, sunflower)
##
##  Two-sample Kolmogorov-Smirnov test
##
## data:  meatmeal and sunflower
## D = 0.5, p-value = 0.1
## alternative hypothesis: two-sided
```

Looking at the histograms and qq-plots we cannot assume normality and we should therefore conclude that there is no difference between the two groups.



b) One-Way ANOVA

The one-way ANOVA shows that there is a difference between the means of the groups (F=*15.37*, $P < .01$).

```r
chickwts_mod = lm(weight~feed, data=chickwts)
anova(chickwts_mod)
## Analysis of Variance Table
##
## Response: weight
##           Df Sum Sq Mean Sq F value  Pr(>F)
## feed       5 231129   46226    15.4 5.9e-10 ***
## Residuals 65 195556    3009
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

As shown in the table and boxplot below, sunflower has the highest expected mean (*M*=329).

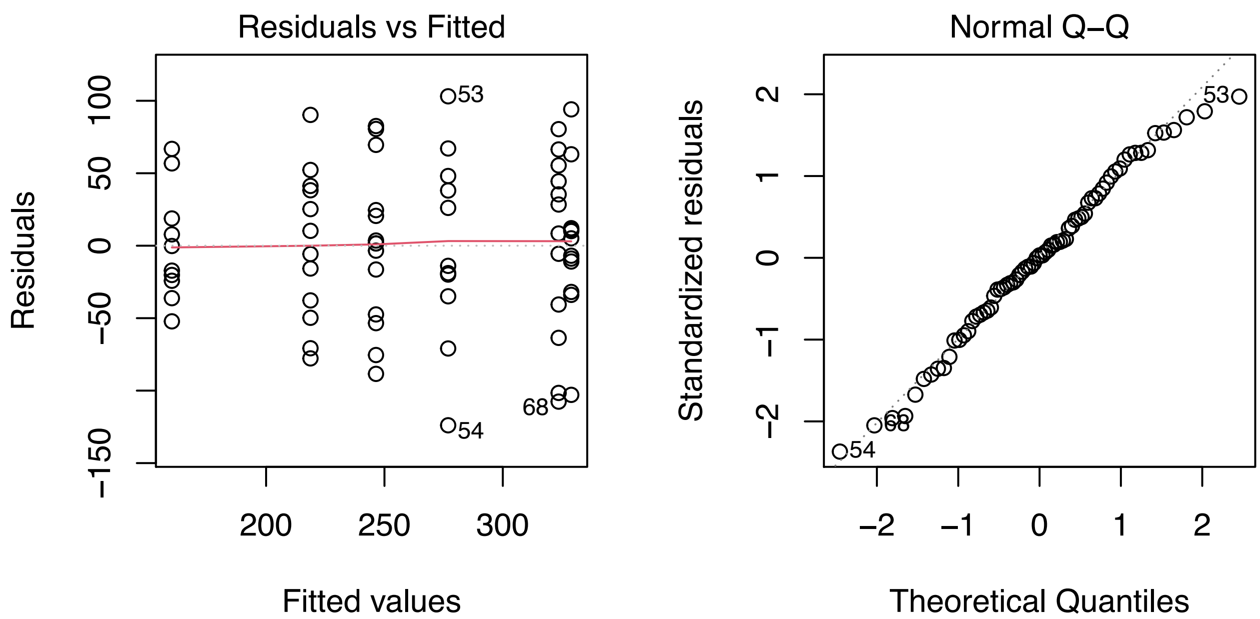
Feed Supplement	Expeted Mean
Meatmeal	276.909
Sunflower	328.917
Casein	323.583
Soybean	246.429
Horsebean	160.2
Linseed	218.75

c) ANOVA model assumptions

The ANOVA model assumption says, that aach group sample is drawn from a normally distributed population, and all populations have a common variance. In order to test the homogenity of variances, we can either plot residuals or conduct a Levene test.

```r
#install.packages("carData")
library(car)
leveneTest(weight ~ feed, data = chickwts)
```

```
## Levene's Test for Homogeneity of Variance (center = median)
##       Df F value Pr(>F)
## group  5    0.75   0.59
##       65
```



With the results from the Levene's test we can assume normality and homogenity of variances. The results with *F(5) = 0.75 and p = 0.59* suggest that the homogenity is given. Since all points fall approximately along the reference line, we can also assume normality. This means both criteria are fulfilled.

d) Kruksal-Wallis vs. ANOVA

```r
#Kruksal test
kruskal.test(weight~feed,data=chickwts)
```

```
##
##  Kruskal-Wallis rank sum test
##
## data:  weight by feed
## Kruskal-Wallis chi-squared = 37, df = 5, p-value = 5e-07
```

As we can see the Kruskal-Wallis test gives us a p-value of 5.113e-07 which means ($p<0.05$) the type of feed has an effect on the weight of the chicks. The Kruskal-Wallis test came to the same conclusion as the ANOVA test in b). However, the Kruskal-Wallis and ANOVA test could come to a different conclusion because the Kruskal-Wallis test does not rely on normality, like ANOVA does, but is based on ranks. This will lead to a different results in some cases, since Kruskal-Wallis is used when the assumptions of a one way ANOVA are not met.