

Homework 4

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Questions for this Week

The homework for Week 4 is exercises 7-10 on page 66

Question 7

Plant Growth - Summary

The built-in `PlantGrowth` data set contains three different groups, each representing a different plant food diet (you may need to type `data(PlantGrowth)` to activate it). The group labeled `"ctrl"` is the control group, while the other two groups are each a different type of experimental treatment. Run the `summary()` command on `PlantGrowth` and explain the output.

```
data("PlantGrowth")  
  
summary(PlantGrowth)
```

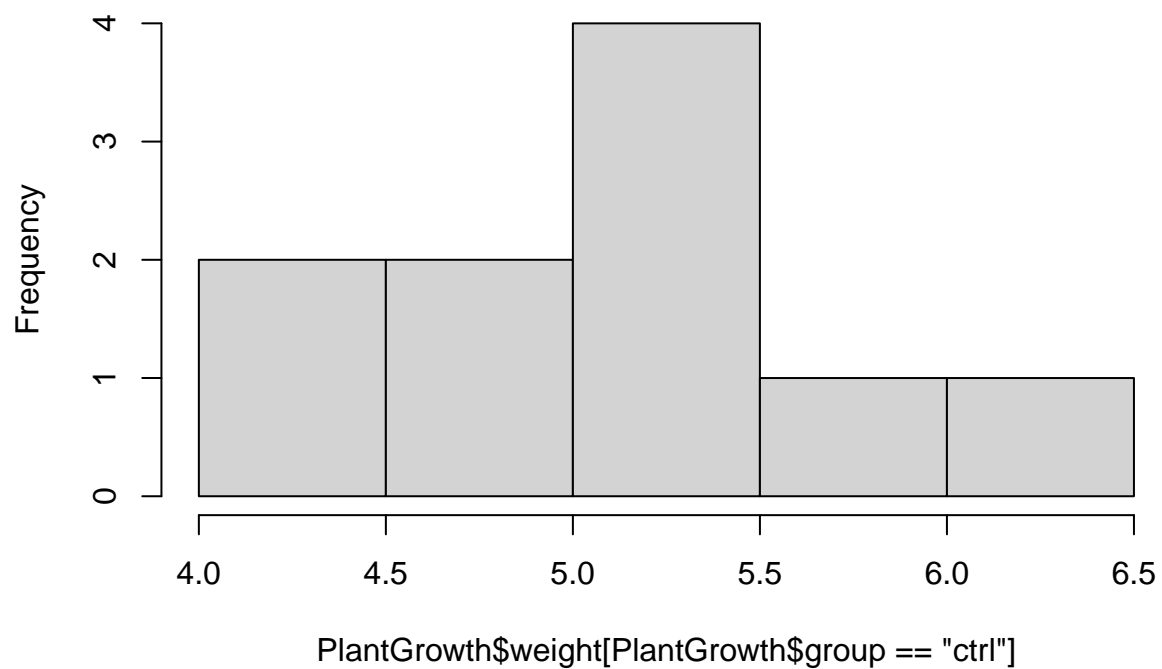
```
##      weight      group  
##  Min.    :3.590   ctrl:10  
##  1st Qu.:4.550   trt1:10  
##  Median :5.155   trt2:10  
##  Mean    :5.073  
##  3rd Qu.:5.530  
##  Max.    :6.310
```

Plant Growth - Histogram

Create a histogram of the `ctrl` group. As a hint about R syntax, here is one way that you can access the `ctrl` group data: `PlantGrowth$weight[PlantGrowth$group=="ctrl"]` Also create histograms of the `trt1` and `trt2` groups.

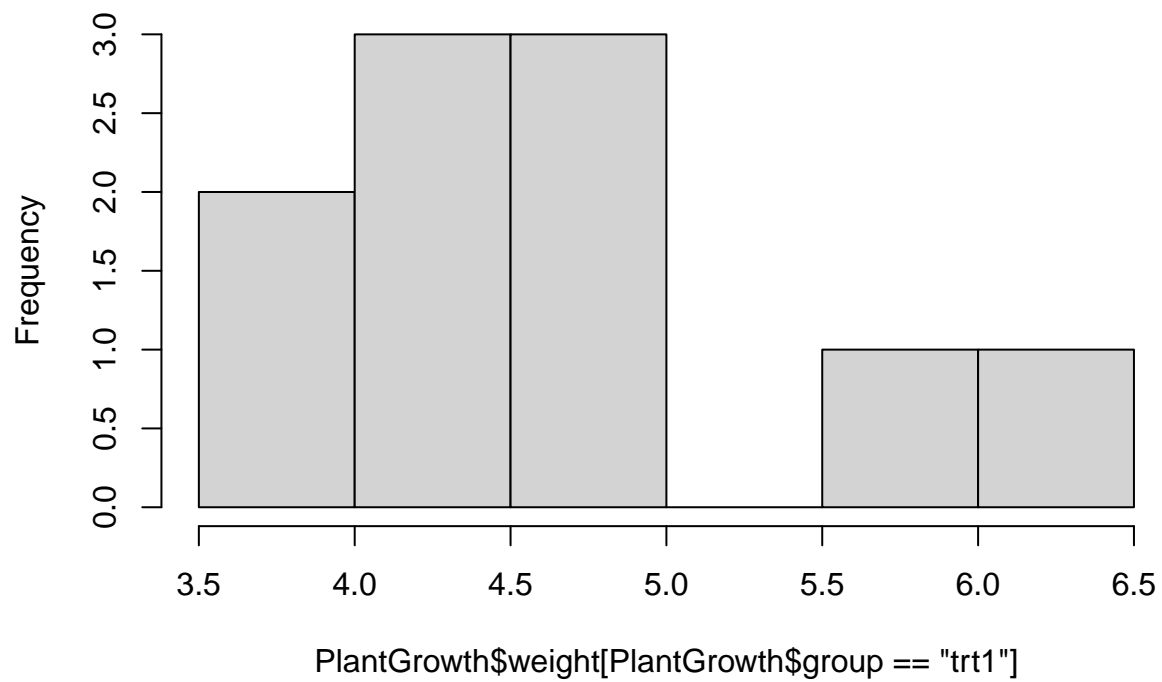
```
hist(PlantGrowth$weight[PlantGrowth$group=="ctrl"])
```

Histogram of PlantGrowth\$weight[PlantGrowth\$group == "ctrl"]



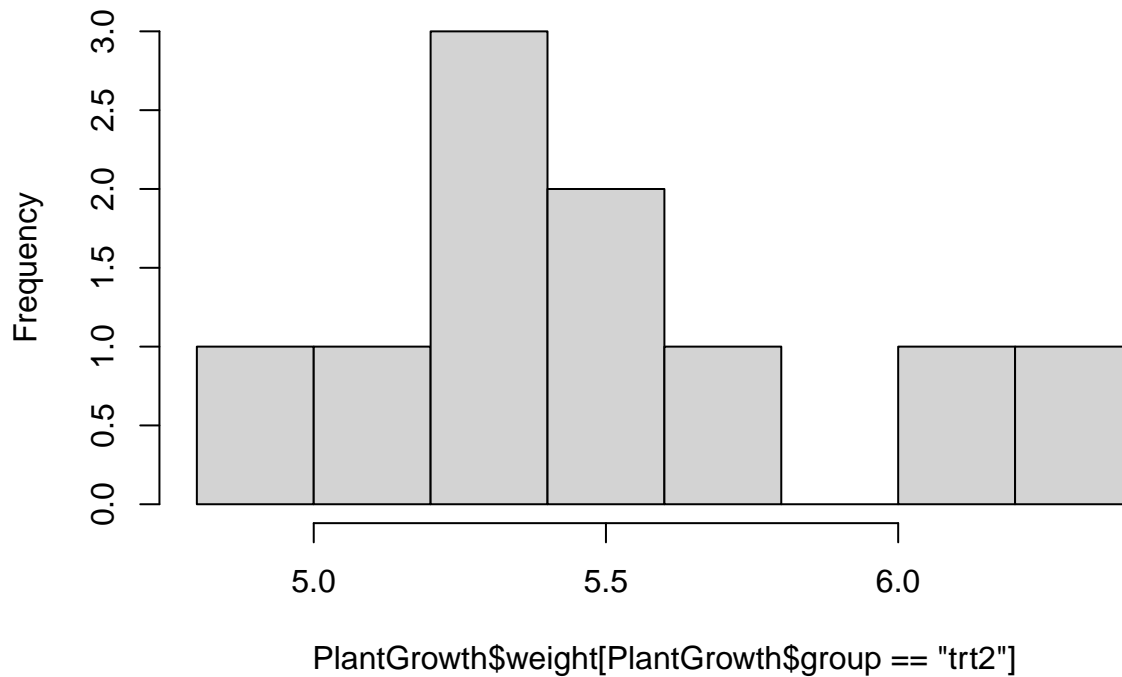
```
hist(PlantGrowth$weight[PlantGrowth$group=="trt1"])
```

Histogram of PlantGrowth\$weight[PlantGrowth\$group == "trt1"]



```
hist(PlantGrowth$weight[PlantGrowth$group=="trt2"])
```

Histogram of PlantGrowth\$weight[PlantGrowth\$group == "trt2"]



Planet Growth - Descriptive Statistics

```
sd(PlantGrowth$weight[PlantGrowth$group=="ctrl"])
```

```
## [1] 0.5830914
```

```
sd(PlantGrowth$weight[PlantGrowth$group=="trt1"])
```

```
## [1] 0.7936757
```

```
sd(PlantGrowth$weight[PlantGrowth$group=="trt2"])
```

```
## [1] 0.4425733
```

```
mean(PlantGrowth$weight[PlantGrowth$group=="ctrl"])
```

```
## [1] 5.032
```

```
mean(PlantGrowth$weight[PlantGrowth$group=="trt1"])
```

```
## [1] 4.661
```

```
mean(PlantGrowth$weight[PlantGrowth$group=="trt2"])
```

```
## [1] 5.526
```

Interpreting Histogram

What can you say about the differences in the groups by looking at the histograms?

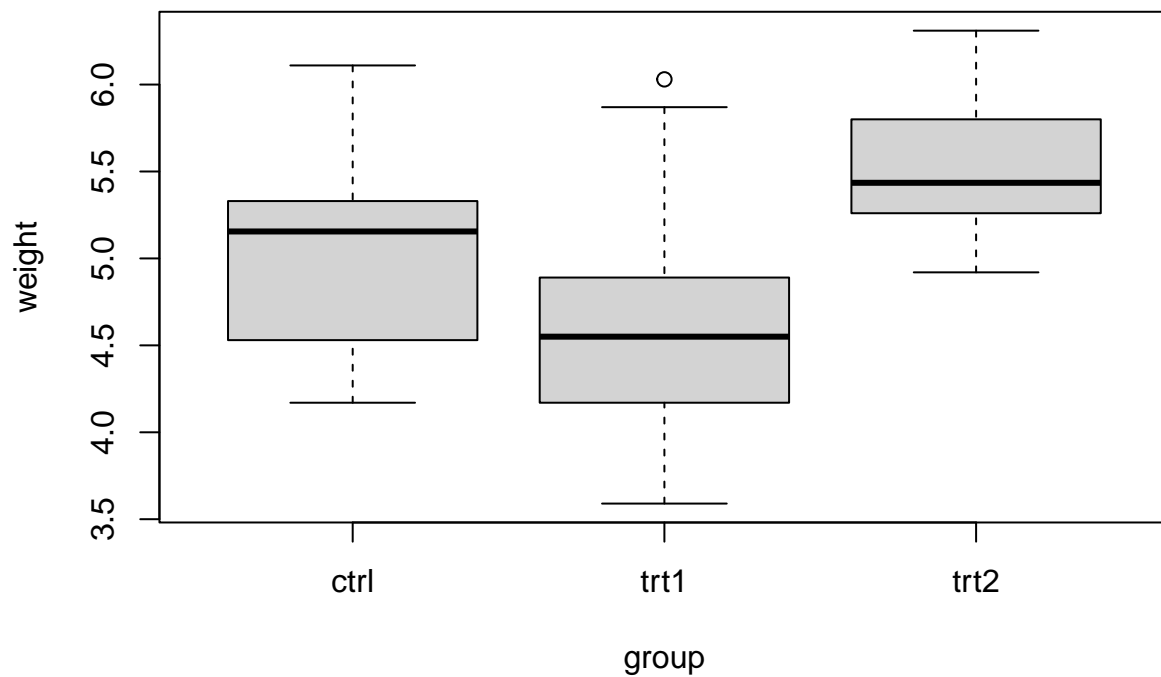
- The min and max for the ctrl is between 4.0 - 6.5, trl1 is between 3.5 - 6.5 without a 5.0 bin, and trl2 is between 5 and 6.
- Trl1 has 2 peaks where trl 2 only has 1 peak and the ctrl has the highest peak.

Question 8

PlantGrowth Boxplot

Create a boxplot of the plant growth data, using the model “weight ~ group.”

```
boxplot(weight ~ group, PlantGrowth)
```



Interpreting the Results

What can you say about the differences in the groups by looking at the **boxplots** for the different groups?

- Each have a different median, the thick black line illustrates this.
- The the minimum value or the lower whisker is all different
- Although the maximum value or the upper whisker is different, each of them are not too far off.

Question 9

T-Test ctrl vs. trt1

Run a t-test to compare the means of `ctrl` and `trt1` in the `PlantGrowth` data.

```
dfCtrl <- PlantGrowth$weight[PlantGrowth$group=="ctrl"]
dfTrt1 <- PlantGrowth$weight[PlantGrowth$group=="trt1"]

t.test(dfCtrl, dfTrt1)

##
##  Welch Two Sample t-test
##
## data:  dfCtrl and dfTrt1
## t = 1.1913, df = 16.524, p-value = 0.2504
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.2875162  1.0295162
## sample estimates:
## mean of x mean of y
##      5.032      4.661
```

T-Test ctrl vs. trt1 Interpreting the Results

Report and interpret the confidence interval. Make sure to include a carefully worded statement about what the confidence interval implies with respect to the population mean difference between the `ctrl` and `trt1` groups.

- 95% of the mean weight difference falls between -0.2875 and 1.0295. Meaning that with 95% confidence the average weight difference between Ctrl and Trt1 will fall between -0.2875 and 1.0295. Although the p-value is 0.2504 which is quite a high p-value.

Question 10

T-Test ctrl vs. trt2

Run a t-test to compare the means of `ctrl` and `trt2` in the `PlantGrowth` data.

```
dfTrt2 <- PlantGrowth$weight[PlantGrowth$group=="trt2"]

t.test(dfCtrl, dfTrt2)

##
##  Welch Two Sample t-test
##
## data:  dfCtrl and dfTrt2
## t = -2.134, df = 16.786, p-value = 0.0479
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -0.98287213 -0.00512787
## sample estimates:
## mean of x mean of y
##      5.032      5.526
```

T-Test ctrl vs. trt2 Interpreting the Results

Report and interpret the confidence interval.

- 95% of the mean weight difference falls between -0.9828 and 0.00512. Meaning that with 95% confidence the average weight difference between Ctrl and Trt2 will fall between -0.9828 and 0.00512. Here though the p-value is 0.0479 which in statistics a p-value under 0.05 is pretty good.