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Homework 4

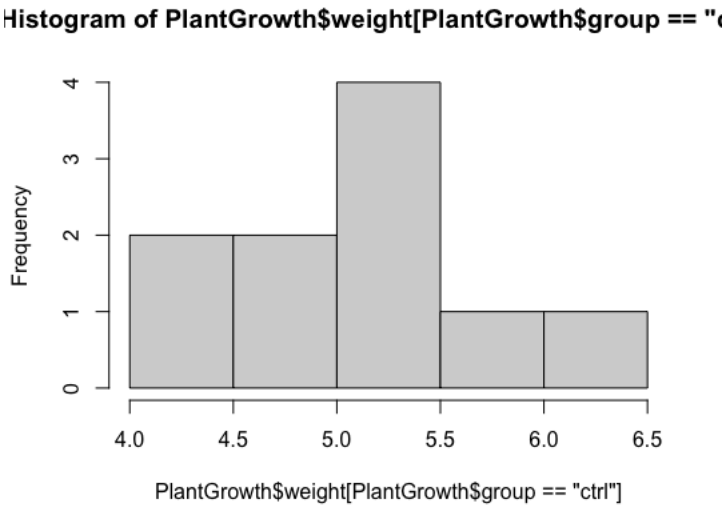
Exercise 7

Code:

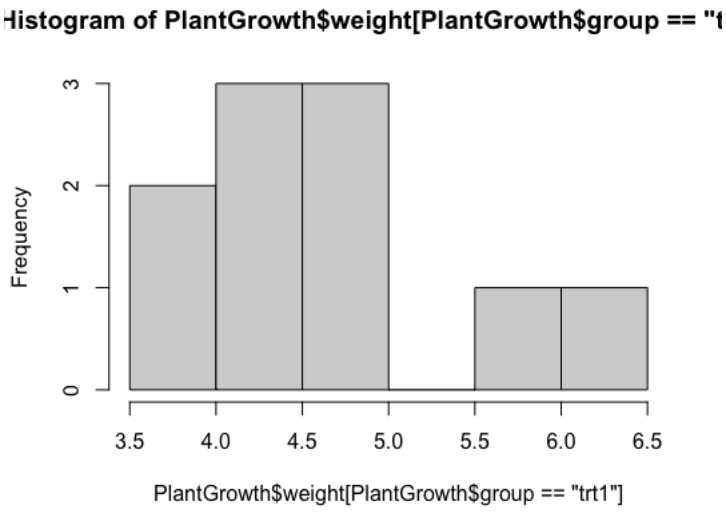
```
>summary(PlantGrowth)
     weight       group
 Min.   :3.590   ctrl:10
 1st Qu.:4.550   trt1:10
 Median :5.155   trt2:10
 Mean   :5.073
 3rd Qu.:5.530
 Max.   :6.310
```

The output of the summary command tells us that there are 2 variables (weight and group). There are only 10 observations of each group, for 30 total observations. The weights range from 3.5 to 6.3, with the average being 5.073 and most weights falling between 4.5 (1st quartile) and 5.53 (3rd quartile).

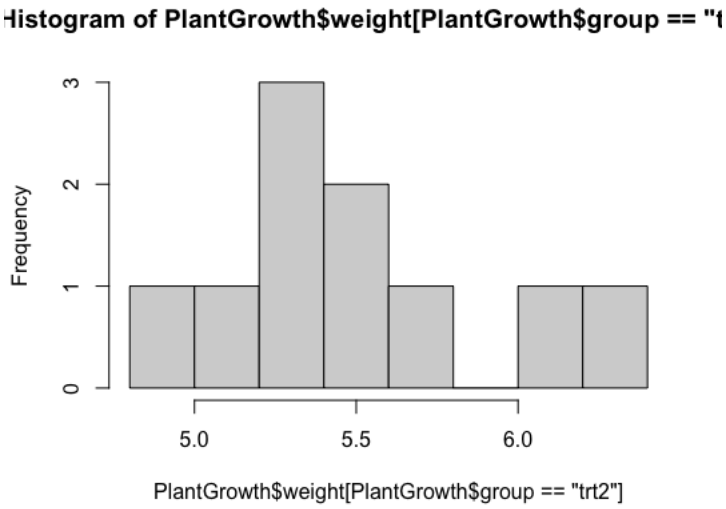
'ctrl' histogram:



'trt1" histogram:



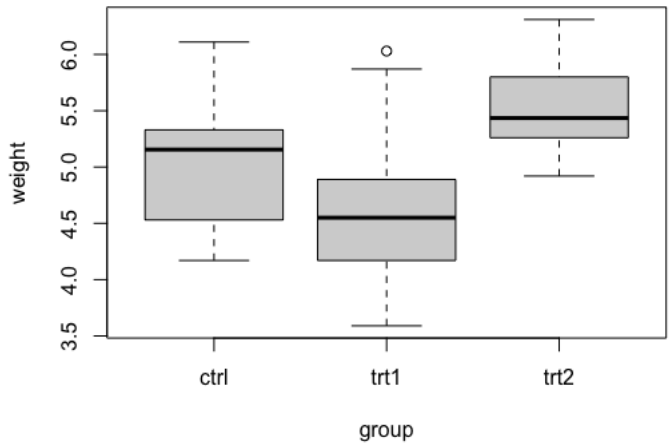
'trt2' histogram:



By looking at the histograms, the control group weighs between 4 and 5.5. 'trt1' has lower weights in general, with 2 that were between the 3rd quartile and overall max. 'trt2' weighs slightly above average or around the average, with a few that were between the 3rd quartile and overall max.

Exercise 8

boxplot(weight ~ group, PlantGrowth):



By looking at the boxplot, we can see that trt1 weighs the least, and trt2 weighs the most. 'trt1' is interesting as it has an outlier and a range from about 3.6 to 5.7, but the median is the same as the 1st quartile of the control group, meaning that only 50% of the plants in trt1 weigh more than 25% of the plants in the ctrl group. On the other hand, we can see that the median of trt2 is slightly above the 3rd quartile of the ctrl group, and the lower end of the whisker is about the same as the 3rd quartile of the trt1 boxplot.

Exercise 9

Code:

```
t.test(PlantGrowth$weight[PlantGrowth$group=='ctrl'],PlantGrowth$weight[PlantGrowth$group=='trt1'])
```

Output:

```
Welch Two Sample t-test

data:  PlantGrowth$weight[PlantGrowth$group == "ctrl"] and
PlantGrowth$weight[PlantGrowth$group == "trt1"]
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
```

Interpretation:

The ‘ctrl’ group weighs on average about -0.29 and 1.03 more than the ‘trt1’ group. However, this difference is not statistically significant because the interval overlaps with 0, meaning that there is a chance that the means of the ‘ctrl’ weights and ‘trt1’ weights could be the same.

Exercise 10

Code:

```
t.test(PlantGrowth$weight[PlantGrowth$group=='ctrl'],PlantGrowth$weight[PlantGrowth$group=='trt2'])
```

output:

```
        Welch Two Sample t-test

data:  PlantGrowth$weight[PlantGrowth$group == "ctrl"] and
PlantGrowth$weight[PlantGrowth$group == "trt2"]
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
```

Interpretation:

The ‘ctrl’ group on average weighs about -0.98 and -0.005 less than the ‘trt2’ group. This difference is statistically significant because the interval does not overlap 0, meaning that it is not likely for the mean weights of the ‘ctrl’ group and ‘trt2’ group to be the same.