Course Project pt2

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Part 2: Inferential Data Analysis

Load libraries and ToothGrowth data

```
library(ggplot2)

## Warning in register(): Can't find generic `scale_type` in package ggplot2
to
## register S3 method.

library(datasets)

data("ToothGrowth")
```

View info about ToothGrowth data

```
str(ToothGrowth)

## 'data.frame':    60 obs. of  3 variables:
##  $ len : num  4.2 11.5 7.3 5.8 6.4 10 11.2 11.2 5.2 7 ...
##  $ supp: Factor w/ 2 levels "OJ","VC": 2 2 2 2 2 2 2 2 2 2 ...
##  $ dose: num  0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 ...

head(ToothGrowth)

##    len supp dose
## 1  4.2   VC  0.5
## 2 11.5   VC  0.5
## 3  7.3   VC  0.5
## 4  5.8   VC  0.5
## 5  6.4   VC  0.5
## 6 10.0   VC  0.5
```

Summary statistics

```
summary(ToothGrowth)

##       len        supp         dose
##  Min.   : 4.20   OJ:30   Min.   :0.500
##  1st Qu.:13.07   VC:30   1st Qu.:0.500
##  Median :19.25           Median :1.000
##  Mean   :18.81           Mean   :1.167
##  3rd Qu.:25.27           3rd Qu.:2.000
##  Max.   :33.90           Max.   :2.000
```

Correct 'dose' varibale

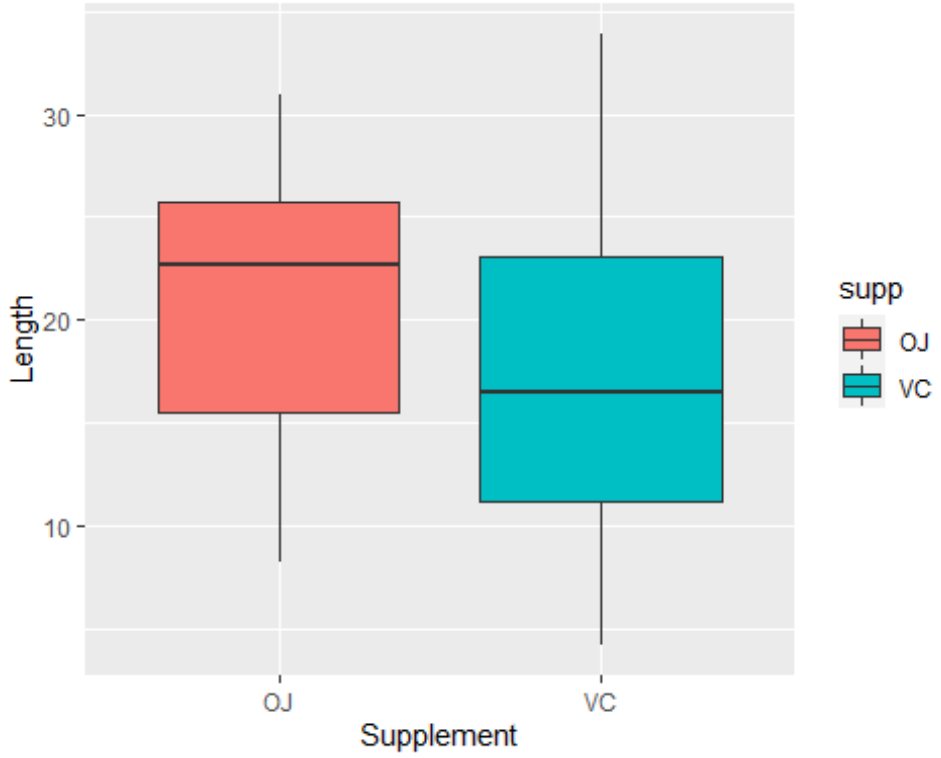
```
ToothGrowth$dose <- as.factor(ToothGrowth$dose)
```

Data Analysis

```
supp_mean <- split(ToothGrowth$len, ToothGrowth$supp)
sapply(supp_mean, mean)

##       OJ       VC
## 20.66333 16.96333

supp_dose <- split(ToothGrowth$len, ToothGrowth$dose)
sapply(supp_dose, mean)

##    0.5      1      2
## 10.605 19.735 26.100
```

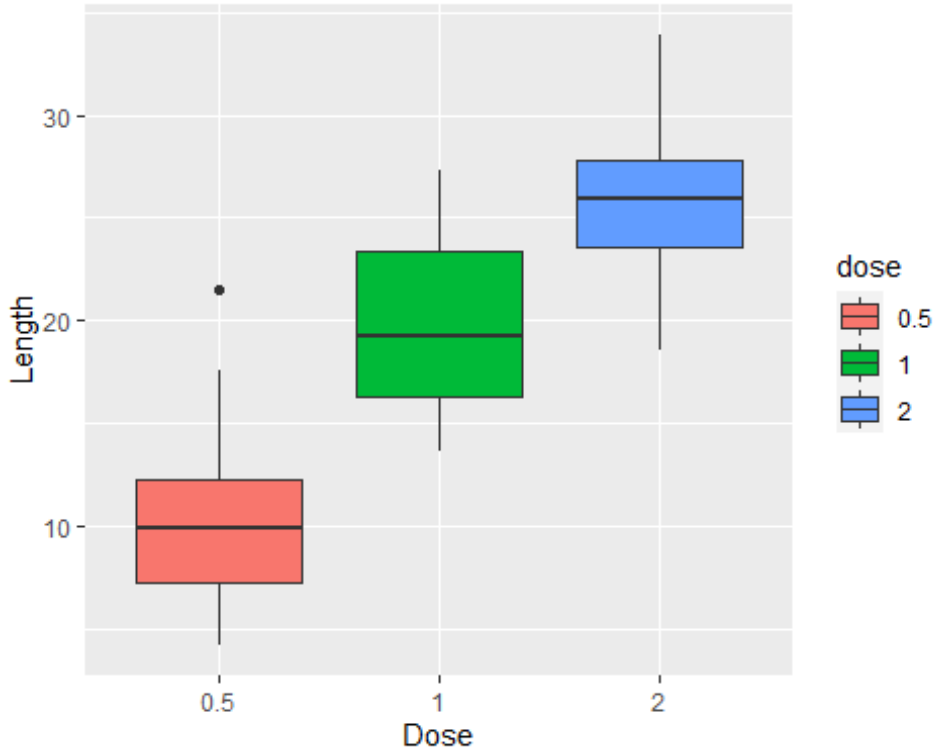
Graph of effect of supplement on tooth length:

```
ggplot(aes(x=supp, y=len), data=ToothGrowth) + geom_boxplot(aes(fill=supp)) +
xlab("Supplement") + ylab("Length")
```



Graph of effect of supplement on tooth length:

```
ggplot(aes(x=dose, y=len), data=ToothGrowth) + geom_boxplot(aes(fill=dose)) +
xlab("Dose") + ylab("Length")
```



Statistical Tests

Create easy to use variables

```
supp <- ToothGrowth$supp
dose <- ToothGrowth$dose
len <- ToothGrowth$len
```

T-Test #1

```
# Check for differences in supplement type
t.test(len[supp == "VC"], len[supp == "OJ"])

##
##  Welch Two Sample t-test
##
## data:  len[supp == "VC"] and len[supp == "OJ"]
## t = -1.9153, df = 55.309, p-value = 0.06063
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -7.5710156  0.1710156
## sample estimates:
## mean of x mean of y
##  16.96333  20.66333
```

The p-value is about 0.06, meaning we cannot reject the null hypothesis that different supplements don't have an effect on tooth length.

T-Test #2

```
# Check for differences in dosage type
# In this test, use 0.5 and 1.0
t.test(len[dose == 0.5], len[dose == 1.0])

##
##  Welch Two Sample t-test
##
## data:  len[dose == 0.5] and len[dose == 1]
## t = -6.4766, df = 37.986, p-value = 1.268e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.983781  -6.276219
## sample estimates:
## mean of x mean of y
##    10.605    19.735
```

The p-value is very close to zero, which shows a considerable impact on tooth length, meaning we can reject the null hypothesis.

For thoroughness, the tests between [0.5 and 2.0] and [1.0 and 2.0] are below, with similar results

```
# 0.5 and 2.0
t.test(len[dose == 0.5], len[dose == 2.0])

##
##  Welch Two Sample t-test
##
## data:  len[dose == 0.5] and len[dose == 2]
## t = -11.799, df = 36.883, p-value = 4.398e-14
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -18.15617 -12.83383
## sample estimates:
## mean of x mean of y
##    10.605    26.100

# 1.0 and 2.0
t.test(len[dose == 1.0], len[dose == 2.0])

##
##  Welch Two Sample t-test
##
## data:  len[dose == 1] and len[dose == 2]
## t = -4.9005, df = 37.101, p-value = 1.906e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -8.996481 -3.733519
## sample estimates:
```

```
## mean of x mean of y
##    19.735    26.100
```

Conclusions

1. The supplement type, statistically speaking, has no significant effect on tooth length.
2. The dosage amount has a significant effect on tooth length