# ToothGrowth

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# Objective

1. Load the ToothGrowth data and perform some basic exploratory data analyses
2. Provide a basic summary of the data.
3. Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose. (Only use the techniques from class, even if there's other approaches worth considering)
4. State your conclusions and the assumptions needed for your conclusions.

# Data Exploration

```
#Load Data
data(ToothGrowth)
#Explore 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 ...
```

```
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
```

```
head(ToothGrowth)
```

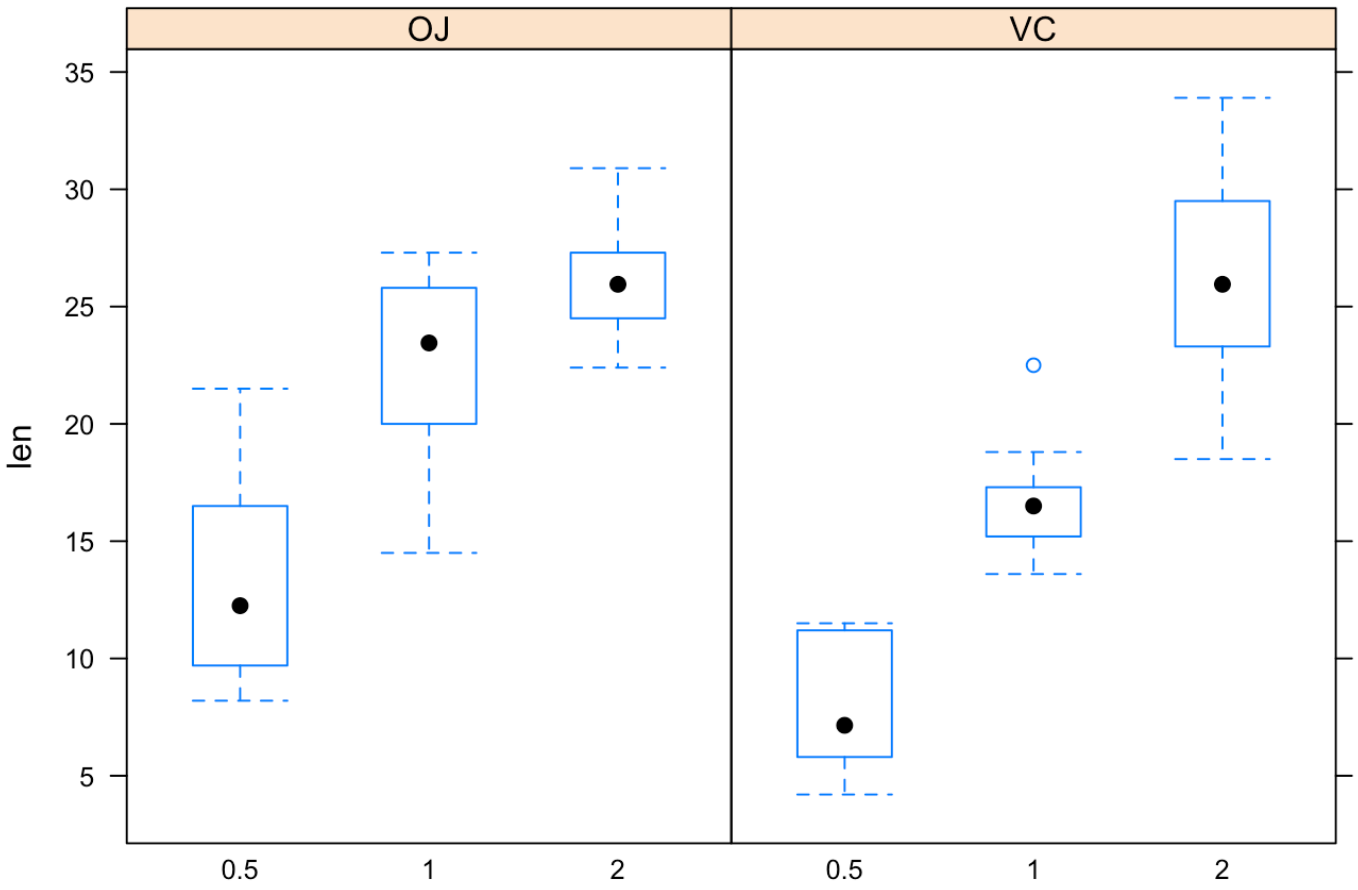
```
##    len supp dose
## 1  4.2   VC  0.5
## 2 11.5   VC  0.5
## 3  7.3   VC  0.5
## 4  5.8   VC  0.5
## 5  6.4   VC  0.5
## 6 10.0   VC  0.5
```

```
unique(ToothGrowth$dose)
```

```
## [1] 0.5 1.0 2.0
```

```
#Convert dose to factor
ToothGrowth$dose <- as.factor(ToothGrowth$dose)

#Plot len by dose partition by supp
bwplot(len ~ dose | supp,data=ToothGrowth)
```




# Hypothesis Testing

# Hypothesis for the supplement OJ vs VC

null hypothesis: No difference in tooth growth when using the supplement OJ and VC. Alternate Hyphothesis: More tooth growth when using supplement OJ than VC.

```
# Partition the data set by supp
OJ = ToothGrowth$len[ToothGrowth$supp == 'OJ']
VC = ToothGrowth$len[ToothGrowth$supp == 'VC']
```

## Perform One-tailed independent t-test with unequal variance

```
t.test(OJ, VC, alternative = "greater", paired = FALSE, var.equal = FALSE, conf.lev
el = 0.95)
```

```
##
##  Welch Two Sample t-test
##
## data:  OJ and VC
## t = 1.9153, df = 55.309, p-value = 0.03032
## alternative hypothesis: true difference in means is greater than 0
## 95 percent confidence interval:
##  0.4682687       Inf
## sample estimates:
## mean of x mean of y
##  20.66333  16.96333
```

As the p-value (0.03032) is lower than 0.05, we reject the null hypothesis. Based on this low p-value, we can conclude that it is very likely that supplement OJ has higher effect on tooth growth than supplement VC.