# Course Project Part 2

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## Overview

In the second portion of this project, we're going to analyze the ToothGrowth data in the R datasets package. The response is the length of teeth in each of 10 guinea pigs at each of three dose levels of Vitamin C (0.5, 1, and 2 mg) with each of two delivery methods (orange juice or ascorbic acid).

### Load the ToothGrowth data, provide a basic summary of the data, and perform some basic exploratory data analyses

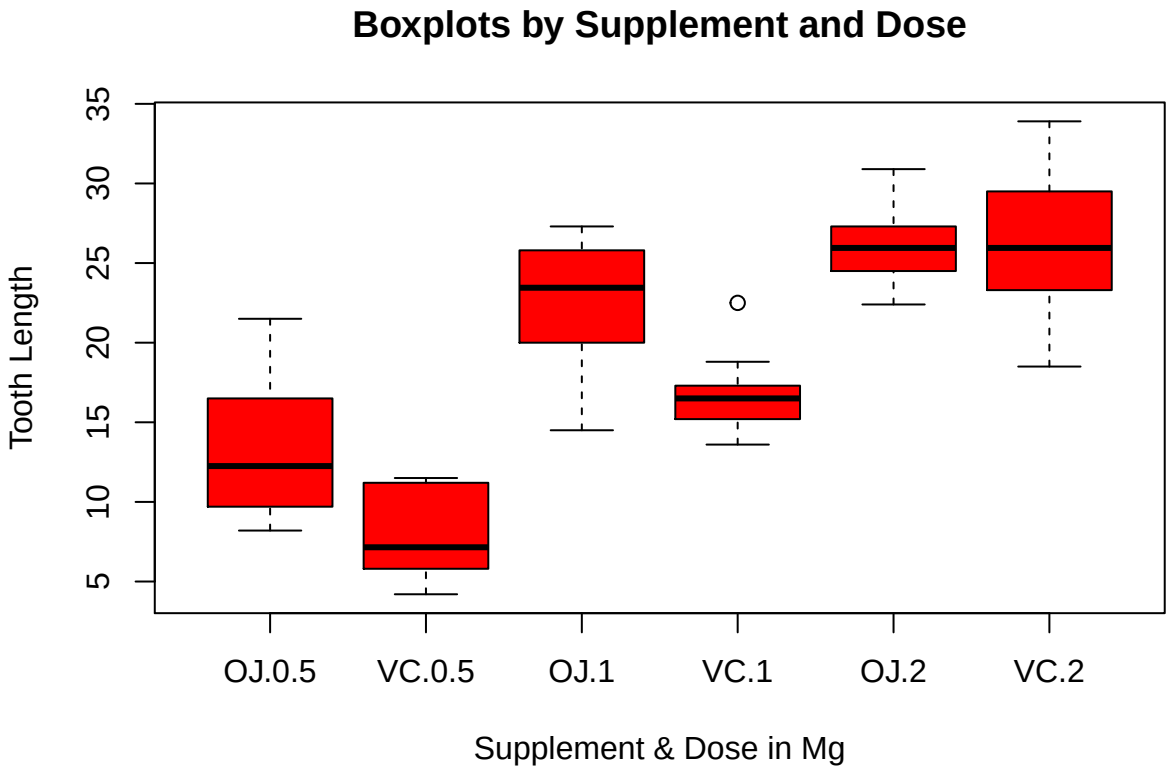
```
library(datasets)
data(ToothGrowth)
str(ToothGrowth)
```

```
## '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 ...
```

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

```
##       len        supp     dose
##  Min.   : 4.20   OJ:30   0.5:20
##  1st Qu.:13.07   VC:30   1  :20
##  Median :19.25           2  :20
##  Mean   :18.81
##  3rd Qu.:25.27
##  Max.   :33.90
```

The following figure infers that at 0.5 mg and 1.0 mg, orange juice leads to increased tooth growth vs. ascorbic acid, while that advantage appears to subside with a dose of 2.0 mg.

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**Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose.**

*With a dose of 0.5 mg*

```
t.test(len ~ supp, ToothGrowth[ToothGrowth$dose==0.5,])
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## t = 3.1697, df = 14.969, p-value = 0.006359
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  1.719057 8.780943
## sample estimates:
## mean in group OJ mean in group VC
##            13.23             7.98
```

*With a dose of 1.0 mg*

```
t.test(len ~ supp, ToothGrowth[ToothGrowth$dose==1.0,])
```

```
##
##  Welch Two Sample t-test
##
```

```
## data:  len by supp
## t = 4.0328, df = 15.358, p-value = 0.001038
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  2.802148 9.057852
## sample estimates:
## mean in group OJ mean in group VC
##            22.70            16.77
```

*With a dose of 2.0 mg*

```
t.test(len ~ supp, ToothGrowth[ToothGrowth$dose==2.0,])
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## t = -0.0461, df = 14.04, p-value = 0.9639
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.79807  3.63807
## sample estimates:
## mean in group OJ mean in group VC
##            26.06            26.14
```

---

### Conclusion

With a dose of 0.5 mg or 1.0 mg, the p-value is less than 0.05 and the confidence interval does not contain 0, indicating that at those doses, orange juice leads to increased tooth growth vs. ascorbic acid. However, with a dose of 2.0 mg, the p-value is greater than 0.05 and the confidence interval contains 0, indicating that there isn't a significant difference between orange juice and ascorbic acid at that dose.