ToothGrowth Inferential Data Analysis

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Load the ToothGrowth data

```r
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.2.4
```

```r
data(ToothGrowth)
```

Provide a basic summary of the data and perform some basic exploratory data analyses

```r
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 ...
```

```r
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  
```
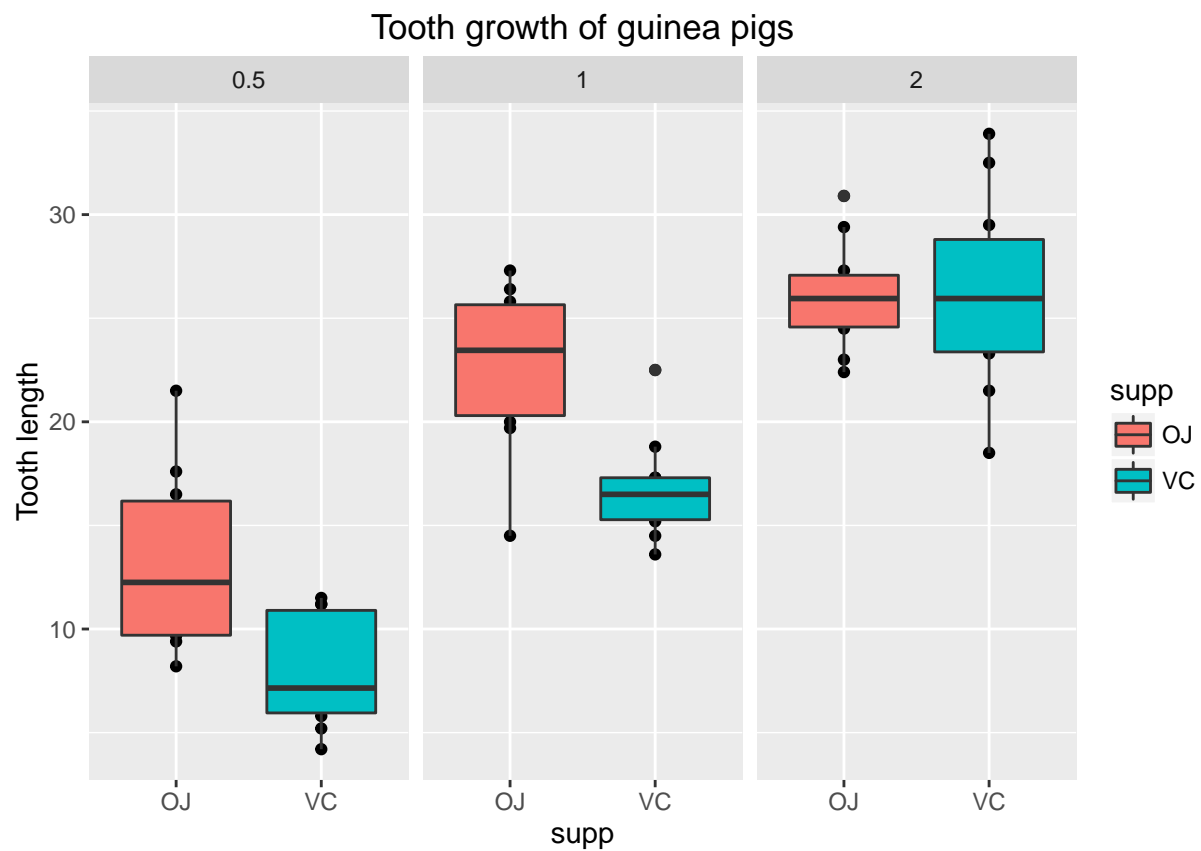
```r
dim(ToothGrowth)
```

```
## [1] 60  3
```

```r
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
```

```
tail(ToothGrowth)
```

```
##      len supp dose
## 55 24.8   OJ    2
## 56 30.9   OJ    2
## 57 26.4   OJ    2
## 58 27.3   OJ    2
## 59 29.4   OJ    2
## 60 23.0   OJ    2
```

```
qplot(supp,len,data=ToothGrowth, facets=~dose, main="Tooth growth of guinea pigs", ylab="Tooth length")
```



```
qplot(dose,len,data=ToothGrowth, facets=~supp, main="Tooth growth of guinea pigs", ylab="Tooth length")
```

```
## Warning: Continuous x aesthetic -- did you forget aes(group=...)?
```

Tooth growth of guinea pigs
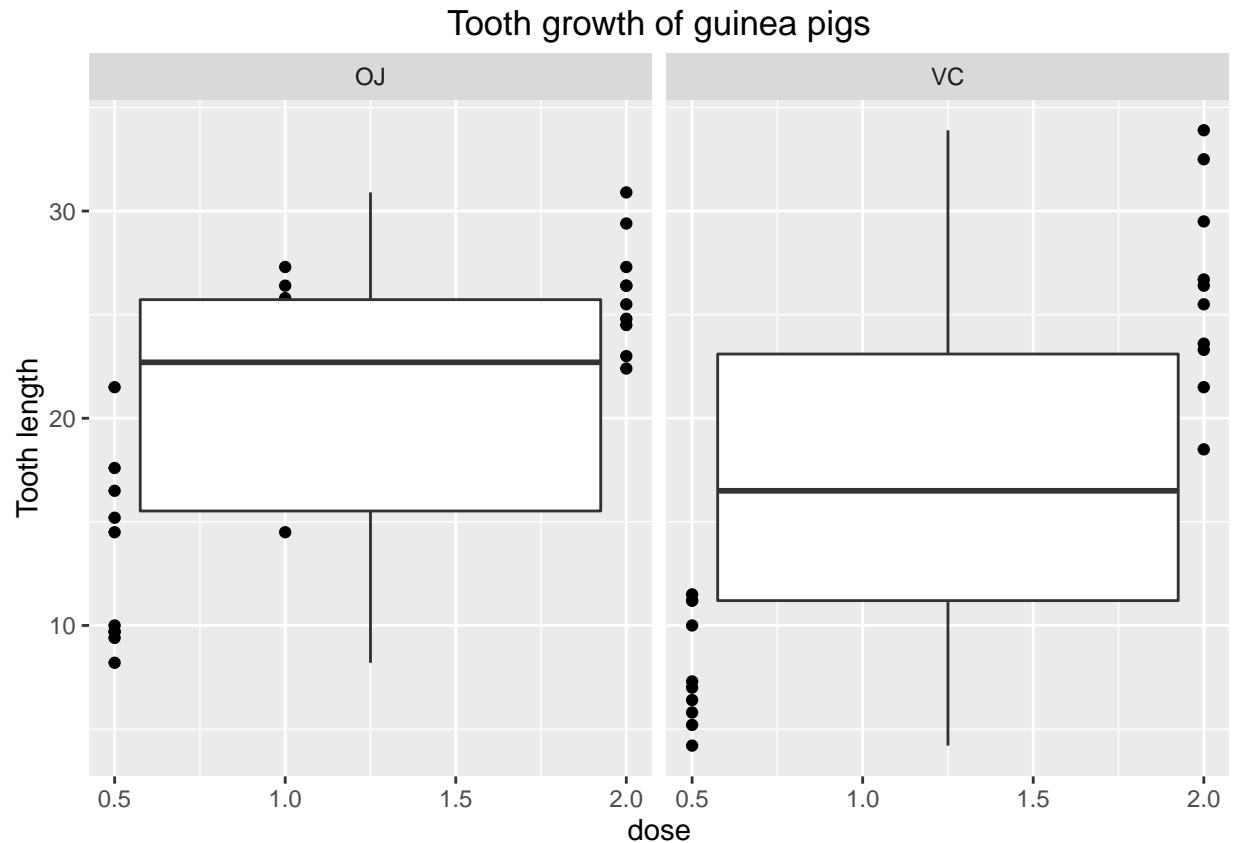
Use confidence intervals and/or hypothesis tests to compare tooth growth by supp and dose.

```
t.test(ToothGrowth$len, ToothGrowth$dose, paired=T, var.equal=T, alt="two.sided")
```

```
##
##  Paired t-test
##
## data:  ToothGrowth$len and ToothGrowth$dose
## t = 19.106, df = 59, p-value < 2.2e-16
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   15.79850 19.49483
## sample estimates:
## mean of the differences
##                 17.64667
```

State your conclusions and the assumptions needed for your conclusions.

As the dose is higher, the lenght of the tooth is higher. OJ supplement produces higher growth than VJ suplement.