Basic-inferential-data-analysis.R

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```
setwd("C:\\Users\\Mahesha\\Desktop\\Desktop\\Data_Science\\Courseera\\Statistic
al Inference")
getwd()
```

```
## [1] "C:/Users/Mahesha/Desktop/Desktop/Data_Science/Courseera/Statistical Inf
erence"
```

```
library(ggplot2)

# Load ToothGrowth data
data("ToothGrowth")

# Display a summary of the data
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 Values
unique(ToothGrowth$len)
```

```
##  [1]  4.2 11.5  7.3  5.8  6.4 10.0 11.2  5.2  7.0 16.5 15.2 17.3 22.5 13.6
## [15] 14.5 18.8 15.5 23.6 18.5 33.9 25.5 26.4 32.5 26.7 21.5 23.3 29.5 17.6
## [29]  9.7  8.2  9.4 19.7 20.0 25.2 25.8 21.2 27.3 22.4 24.5 24.8 30.9 29.4
## [43] 23.0
```

```
unique(ToothGrowth$supp)
```

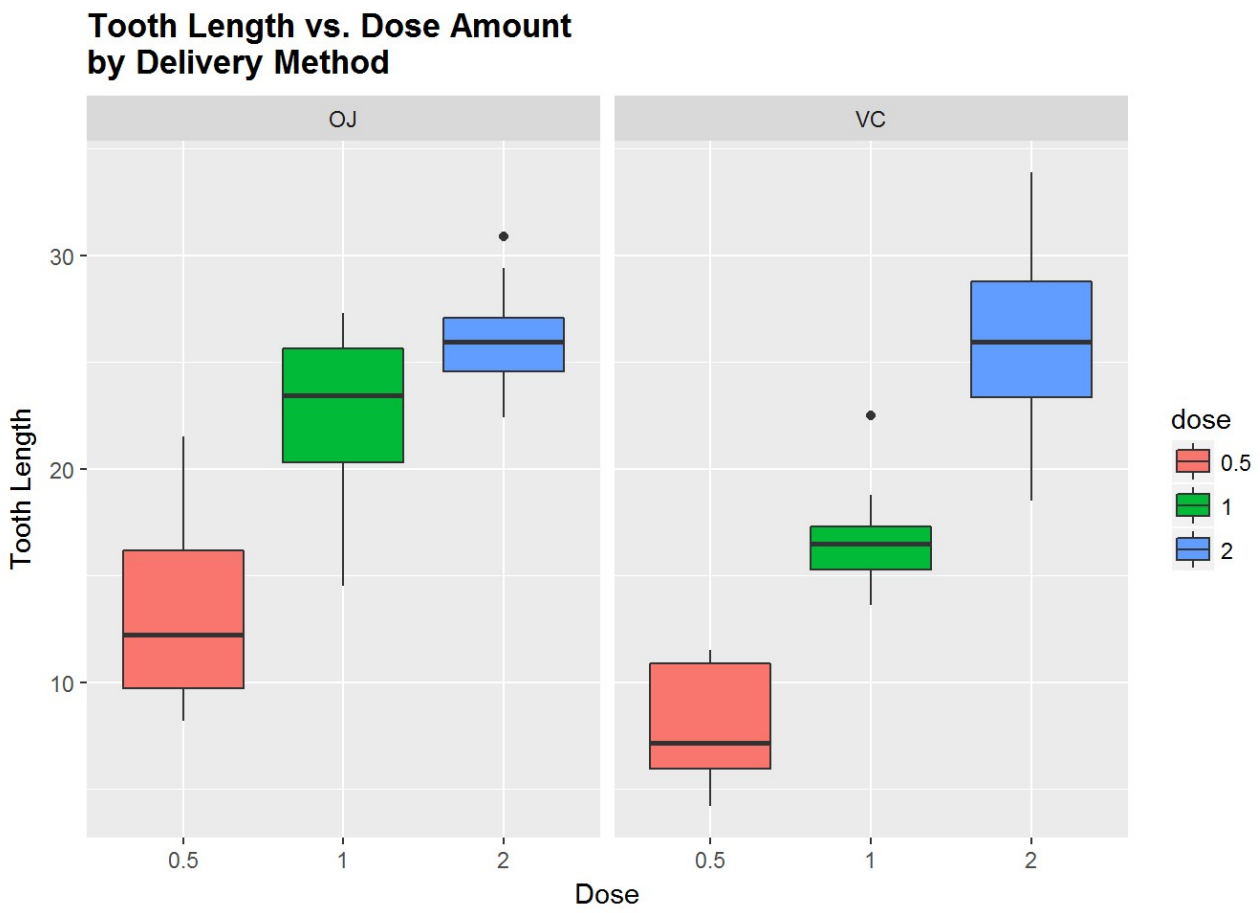
```
## [1] VC OJ
## Levels: OJ VC
```

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

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

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

# Plot tooth length ('len') vs. the dose amount ('dose'), broken out by supplem
ent delivery method ('supp')
ggplot(aes(x=dose, y=len), data=ToothGrowth) + geom_boxplot(aes(fill=dose)) + x
lab("Dose") + ylab("Tooth Length") + facet_grid(~ supp) + ggtitle("Tooth Lengt
h vs. Dose Amount \nby Delivery Method") +
  theme(plot.title = element_text(lineheight=.9, face="bold"))
```




```
# Plot tooth length ('len') vs. supplement delivery method ('supp') broken out
by the dose amount ('dose')
ggplot(aes(x=supp, y=len), data=ToothGrowth) + geom_boxplot(aes(fill=supp)) + x
lab("Supplement Delivery") + ylab("Tooth Length") + facet_grid(~ dose) + ggtitl
e("Tooth Length vs. Delivery Method \nby Dose Amount") +
  theme(plot.title = element_text(lineheight=.9, face="bold"))
```


```
# run t-test to compare tooth growth by supplement
t.test(len~supp,data=ToothGrowth)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by supp
## 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:
##  -0.1710156  7.5710156
## sample estimates:
## mean in group OJ mean in group VC
##         20.66333         16.96333
```

```
#Since the p-value is greater than 0.05 and the confidence interval of the test
contains zero we can say that supplement types seems to have no impact on Toot
h growth based on this test.
#Now we'll compare tooth growth by dose, looking at the different pairs of dos
e values.

# run t-test using dose amounts 0.5 and 1.0
ToothGrowth_sub <- subset(ToothGrowth, ToothGrowth$dose %in% c(1.0,0.5))
t.test(len~dose,data=ToothGrowth_sub)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by dose
## 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 in group 0.5   mean in group 1
##            10.605            19.735
```

```
# run t-test using dose amounts 0.5 and 2.0
ToothGrowth_sub <- subset(ToothGrowth, ToothGrowth$dose %in% c(0.5,2.0))
t.test(len~dose,data=ToothGrowth_sub)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by dose
## 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 in group 0.5   mean in group 2
##            10.605            26.100
```

```
# run t-test using dose amounts 1.0 and 2.0
ToothGrowth_sub <- subset(ToothGrowth, ToothGrowth$dose %in% c(1.0,2.0))
t.test(len~dose,data=ToothGrowth_sub)
```

```
##
##  Welch Two Sample t-test
##
## data:  len by dose
## 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 in group 1 mean in group 2
##          19.735          26.100
```

```
#As can be seen, the p-value of each test was essentially zero and the confiden
ce interval of each test does not cross over zero (0).
#Based on this result we can assume that the average tooth length increases wit
h an inceasing dose, and therefore the null hypothesis can be rejected.

#Conclusions
#Given the following assumptions:
#1. The sample is representative of the population
#2. The distribution of the sample means follows the Central Limit Theorem
#In reviewing our t-test analysis from above, we can conclude that supplement d
elivery method has no effect on tooth growth/length, however increased dosages
do result in increased tooth length.
```