Appendix Part II: Codes and Test Results

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1.Introduction

Code for Fig.1

```
yoj = median(ToothGrowth$len[ToothGrowth$supp=="OJ"])
yvc = median(ToothGrowth$len[ToothGrowth$supp=="VC"])
par(mfrow = c(1,2))
boxplot(len ~ supp, data= ToothGrowth, ylab= "Tooth length",
        xlab= "Supplement type")
     text(x = c(1,2), y= c(yoj+1.5, yvc+1.5), labels = c(
         paste("median=", format(yoj, nsmall = 2), sep=""),
         paste("median=", format(yvc, nsmall = 2), sep="")),
          col = "blue", cex= .8)
y05 = median(ToothGrowth$len[ToothGrowth$dose==.5])
y1 = median(ToothGrowth$len[ToothGrowth$dose==1])
y2 = median(ToothGrowth$len[ToothGrowth$dose==2])
boxplot(len ~ dose, data= ToothGrowth, xlab= "Dose in milligrams")
    text(x = c(1,2, 3), y= c(y05+1.5, y1+1.5, y2+1.5), labels = c(
         paste("med=", format(y05, nsmall = 2), sep=""),
         paste("med=", format(y1, nsmall = 2), sep=""),
         paste("med=", format(y2, nsmall = 2), sep="")),
          col = "blue", cex= .8)
title(outer = TRUE, main= "\n\n\n\n\n\nFig.1: Tooth Growth by Supplement type
      and Dose level", cex.main= .9, cex.axis=.7)
```

2. Hypothesis Test: Compare Tooth Growth by Supplement Type

Code for Fig.2

```
library(ggplot2)
tg <- ggplot(data= ToothGrowth, aes(x= supp, y= len)) + geom_point()
tg <- tg + facet_grid(. ~ dose)
tg + geom_boxplot(aes(group= supp), color= "red") +
    labs(title= "Fig.2: Tooth Growth by Supplement Type",
         x = "Supplement type", y= "Tooth length") +
    theme(title = element_text(size=rel(.8)))
```

2.2 Second panel of Fig.2 (Is there a significant difference between the group on OJ and the group on VC in terms of tooth length at the dose level of 1): Code for and results of the corresponding t.test

```r
library(dplyr)
lenoj1 <- filter(ToothGrowth, supp=="OJ" & dose==1)$len # a 10-value vector of tooth length
lenvc1 <- filter(ToothGrowth, supp=="VC" & dose==1)$len # a 10-value vector of tooth length
t.test(x = lenoj1, y = lenvc1, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  lenoj1 and lenvc1
## t = 4.0328, df = 18, p-value = 0.0007807
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  2.840692 9.019308
## sample estimates:
## mean of x mean of y
##     22.70     16.77
```

2.3 Third panel of Fig.2 (Is there a significant difference between the group on OJ and the group on VC in terms of tooth length at the dose level of 2): Code for and results of the corresponding t.test

```r
lenoj2 <- filter(ToothGrowth, supp=="OJ" & dose==2)$len # a 10-value vector of tooth length
lenvc2 <- filter(ToothGrowth, supp=="VC" & dose==2)$len # a 10-value vector of tooth length
t.test(x = lenoj2, y = lenvc2, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  lenoj2 and lenvc2
## t = -0.046136, df = 18, p-value = 0.9637
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.722999  3.562999
## sample estimates:
## mean of x mean of y
##     26.06     26.14
```

3. Hypothesis Test: Compare Tooth Growth by Dose Level

Code for Fig.3

```r
library(ggplot2)
tg <- ggplot(data= ToothGrowth, aes(x= dose, y= len)) + geom_point() +
    scale_x_continuous(breaks = ToothGrowth$dose)
tg <- tg + facet_grid(. ~ supp)
tg + geom_boxplot(aes(group= dose), color= "red") +
    labs(title= "Fig.3: Tooth Growth by Dose Level",
         x = "Dose in milligrams", y= "Tooth length") +
    theme(title = element_text(size=rel(.8)))
```

3.1 First panel of Fig.3 (Is there a significant difference between the group on 0.5 mg. of OJ and the group on 2 mgs. of OJ in terms of tooth length): Code for and results of the corresponding t.test

```
library(dplyr)
lenoj05 <- filter(ToothGrowth, supp=="OJ" & dose==.5)$len # a 10-value vector of tooth length
lenoj2 <- filter(ToothGrowth, supp=="OJ" & dose==2)$len # a 10-value vector of tooth length

t.test(lenoj2, lenoj05, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  lenoj2 and lenoj05
## t = 7.817, df = 18, p-value = 3.402e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##   9.381777 16.278223
## sample estimates:
## mean of x mean of y
##     26.06     13.23
```

3.2 Second panel of Fig.3 (Is there a significant difference between the group on 0.5 mg. of VC and the group on 2 mgs. of VC in terms of tooth length): Code for and results of the corresponding t.test

```
library(dplyr)
lenvc05 <- filter(ToothGrowth, supp=="VC" & dose==.5)$len # a 10-value vector of tooth length
lenvc2 <- filter(ToothGrowth, supp=="VC" & dose==2)$len # a 10-value vector of tooth length

t.test(lenvc2, lenvc05, var.equal = TRUE)
```

```
##
##  Two Sample t-test
##
## data:  lenvc2 and lenvc05
## t = 10.388, df = 18, p-value = 4.957e-09
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  14.48716 21.83284
## sample estimates:
## mean of x mean of y
##     26.14      7.98
```