Statistical Inference Course Project

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Overwiew

In this project for Statistical Inference course I will report my results of exponential distribution simulation and basic inferential data analysis of the tooth growth in Guinea Pigs supplemented with a vitamin C.

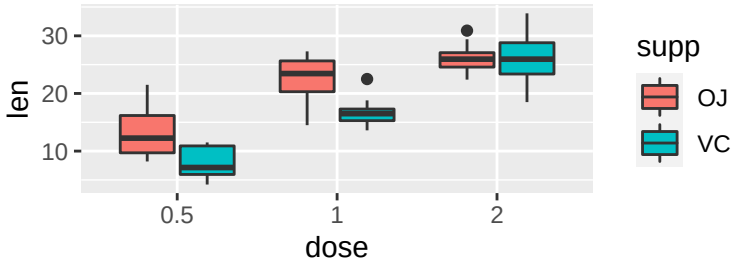
Part 2: Basic Inferential Data Analysis Instructions

Loading ggplot2 and datasets. Changing dose and supp as a factor.

```
library(datasets)
library(ggplot2)
ToothGrowth$dose <- as.factor(ToothGrowth$dose)
ToothGrowth$supp <- as.factor(ToothGrowth$supp)
```

Creating exploratory plot.

```
a <- ggplot(ToothGrowth, aes(x = dose, y = len, fill = supp))
a <- a + geom_boxplot()
a
```



Splitting data into numeric vectors - see supplement

Calculating summary of tooth length for each dose of vitamin C and each supplement type.

```
summary(lenVC05)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    4.20    5.95    7.15    7.98   10.90   11.50
```

```
summary(lenVC10)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   13.60   15.28   16.50   16.77   17.30   22.50
```

```
summary(lenVC20)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   18.50   23.38   25.95   26.14   28.80   33.90
```

```
summary(lenOJ05)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    8.20    9.70   12.25   13.23   16.18   21.50
```

```
summary(lenOJ10)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   14.50   20.30   23.45   22.70   25.65   27.30
```

```
summary(lenOJ20)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##   22.40   24.57   25.95   26.06   27.07   30.90
```

Testing if the dose of vitamin C from supplementation with ascorbic acid correspond to tooth length.

I have used independent 2-group t-test with unequal variances.

```
t.test(lenVC05, lenVC10, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenVC05 and lenVC10
## t = -7.4634, df = 17.862, p-value = 6.811e-07
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -11.265712  -6.314288
## sample estimates:
## mean of x mean of y
##      7.98     16.77
```

```
t.test(lenVC05, lenVC20, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenVC05 and lenVC20
## t = -10.388, df = 14.327, p-value = 4.682e-08
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -21.90151 -14.41849
## sample estimates:
## mean of x mean of y
##      7.98     26.14
```

The bigger the dose, the longer the teeth (p-value = 6.811e-07 and p-value = 4.682e-08 respectively). The same is true for the supplementation with Orange Juice, see supplement

Testing if there are differences between supplement type and tooth length.

I have used independent 2-group t-test with unequal variances.

```
t.test(lenVC05, lenOJ05, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenVC05 and lenOJ05
## 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:
##  -8.780943 -1.719057
## sample estimates:
## mean of x mean of y
##      7.98     13.23
```

```
t.test(lenVC10, lenOJ10, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenVC10 and lenOJ10
## 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:
##  -9.057852 -2.802148
## sample estimates:
## mean of x mean of y
##     16.77     22.70
```

```
t.test(lenVC20, lenOJ20, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenVC20 and lenOJ20
## t = 0.046136, df = 14.04, p-value = 0.9639
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -3.63807  3.79807
## sample estimates:
## mean of x mean of y
##     26.14     26.06
```

For doses 0.5 and 1.0 tooth length is bigger for the orange juice than for ascorbic acid (p = 0.006359 and p = 0.001038 respectively). For dose 2.0 there is no difference between supplement types and tooth length (p = 0.9639).

Supplement

Splitting data into numeric vectors

```
lenVC05 <- ToothGrowth [1:10, 1]
lenVC10 <- ToothGrowth [11:20, 1]
```

```
lenVC20 <- ToothGrowth [21:30, 1]
lenOJ05 <- ToothGrowth [31:40, 1]
lenOJ10 <- ToothGrowth [41:50, 1]
lenOJ20 <- ToothGrowth [51:60, 1]
```

Testing if the dose of vitamin C from supplementation with orange juice correspond to tooth length.

I have used independent 2-group t-test with unequal variances.

```
t.test(lenOJ05, lenOJ10, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenOJ05 and lenOJ10
## t = -5.0486, df = 17.698, p-value = 8.785e-05
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -13.415634  -5.524366
## sample estimates:
## mean of x mean of y
##     13.23     22.70
```

```
t.test(lenOJ05, lenOJ20, paired = FALSE, var.equal = FALSE)
```

```
##
##  Welch Two Sample t-test
##
## data:  lenOJ05 and lenOJ20
## t = -7.817, df = 14.668, p-value = 1.324e-06
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -16.335241  -9.324759
## sample estimates:
## mean of x mean of y
##     13.23     26.06
```

The bigger the dose, the longer the teeth