---
title: "Week 4 Project, Part 2 -- Basic Inference"
author: "Dhruv Singh"
date: "February 16, 2020"
output:
  pdf_document: default
  html_document: default

PART 0: SETUP

echo settings for embedding code

```{r setup, include=FALSE}
knitr::opts_chunk$set(echo = TRUE)
```

Setting Directory

```{r dir}
getwd()
setwd("C:/Dhruv/misc/data/R_6_statistical_inference/wk4_power_sampling")
```

```
[1] "C:/Dhruv/misc/data/R_6_statistical_inference/wk4_power_sampling"
```

PART II: Basic Inference

Step 1: Loading tooth growth package

```{r packages}
# install.packages('datasets', repos='http://cran.us.r-project.org')
library(datasets)
```

Loading tooth growth data

```{r 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 ...
```

Step 2: Basic Data Summary

```{r summary}

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
```

Step 3: Confidence intervals

```{r confint}

fit <- lm(len ~ dose + supp, ToothGrowth)

summary(fit)

```

```
Call:
lm(formula = len ~ dose + supp, data = ToothGrowth)

Residuals:
   Min     1Q Median     3Q    Max
-6.600 -3.700  0.373  2.116  8.800

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)   9.2725     1.2824   7.231 1.31e-09 ***
dose          9.7636     0.8768  11.135 6.31e-16 ***
suppVC       -3.7000     1.0936  -3.383   0.0013 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 4.236 on 57 degrees of freedom
Multiple R-squared:  0.7038,   Adjusted R-squared:  0.6934
F-statistic: 67.72 on 2 and 57 DF,  p-value: 8.716e-16
```

hypothesis testing

```{r hyp}

confint(fit, "dose")

```

```
        2.5 %  97.5 %
dose 8.007741 11.5194
```

Step 4: Write-up

```{r conclusions}

# with 95 % confidence level, we can say that the dose of tooth growth meds affects tooth length by a factor of 8 to 11 units.


# assuming normality in distribution of tooth length data

```