ToothGrowth Simulation

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1 Summary

```
summary(ToothGrowth)
```

Overall Summary

```
      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
```

1.1 Summary according to Supplement Type

```
: OJ
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
   8.20   15.52  22.70  20.66  25.72  30.90
------------------------------------------------------------
: VC
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
   4.20   11.20  16.50  16.96  23.10  33.90
```

1.2 Summary according to Supplement type and Dose Amount

```
by(ToothGrowth$len, INDICES = list(ToothGrowth$supp, ToothGrowth$dose),
    summary)
```

```
: OJ
: 0.5
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
```

```
   8.20    9.70   12.25   13.23   16.18   21.50
------------------------------------------------------------
: VC
: 0.5
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
   4.20    5.95    7.15   7.98   10.90   11.50
------------------------------------------------------------
: OJ
: 1
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  14.50   20.30   23.45   22.70   25.65   27.30
------------------------------------------------------------
: VC
: 1
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  13.60   15.27   16.50   16.77   17.30   22.50
------------------------------------------------------------
: OJ
: 2
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  22.40   24.58   25.95   26.06   27.08   30.90
------------------------------------------------------------
: VC
: 2
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  18.50   23.38   25.95   26.14   28.80   33.90
```

1.3 Summary according to Dose Amount

```
by(ToothGrowth$len, INDICES = list(ToothGrowth$dose), summary)
```

```
: 0.5
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  4.200   7.225   9.850 10.600 12.250 21.500
------------------------------------------------------------
: 1
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  13.60   16.25   19.25   19.74   23.38   27.30
------------------------------------------------------------
: 2
   Min. 1st Qu. Median   Mean 3rd Qu.   Max.
  18.50   23.52   25.95   26.10   27.83   33.90
```

2 Confidence Intervals

2.1 Supplement Type

```
getGossetCI <- function(x, y) {
   nX <- length(x)
   nY <- length(y)
   xBar<-mean(x)
   yBar<-mean(y)
   xVar<-(sd(x))^2
   yVar<-(sd(y))^2
   q<-(((xVar+yVar)/nX)^2)/((((xVar/nX)^2)+((yVar/nY)^2))/(nX - 1))
   t<-qt(0.975, q)
   return (yBar - xBar + c(-1,1)*t*sqrt(xVar/nX + yVar/nY))

}
getGossetCI(ToothGrowth$len[1:30], ToothGrowth$[31:60])
mean(ToothGrowth$len[31:60]) - mean(ToothGrowth$len[1:30])
```

We find the confidence interval between the dataset with VitC and OJ and the difference between the two means.

[1] -0.1710156 7.5710156 -3.7