Assignment

1. Show the sample mean and compare it to theoretical mean of distribution
   Theoritical mean : 1/lamda = 1/0.2 = 5

```
 Sample mean: sample size is 40 with lamda 0.2
mns=NULL

for (i in 1 : 1000) mns = c(mns, mean(rexp(40,0.2)))
data <- data.frame(mns,size=40)
hist(mns)
mean(mns)
[1] 5.047502
```
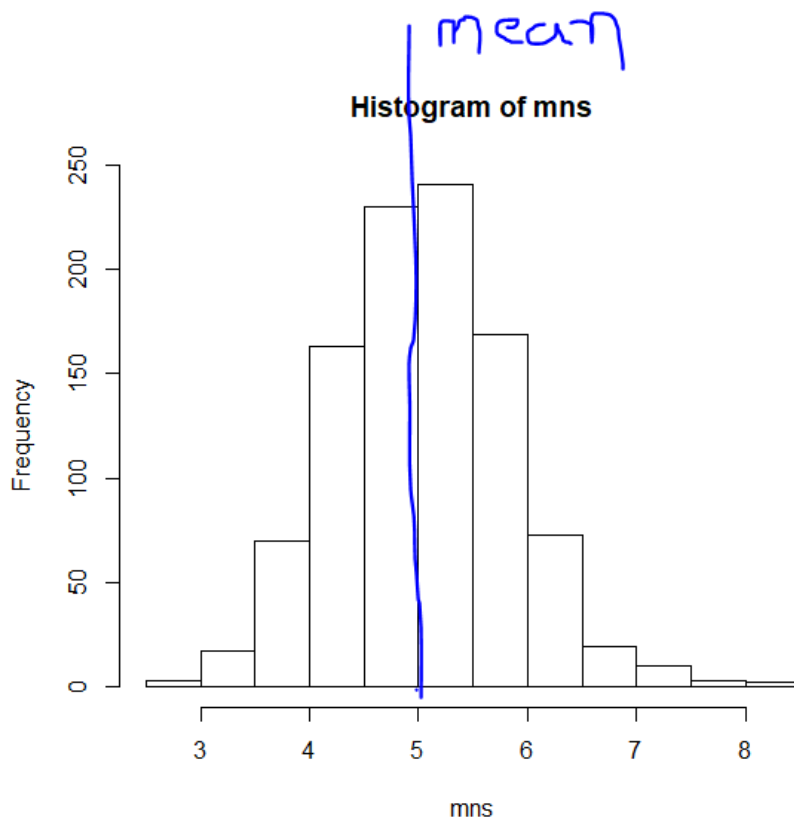
```
Theoritical mean is 5 and sample mean is 5.047, it is same.
```

2. Show how variable the sample is(via variance) and compare it to the theoretical variance of the distribution
   Theoritical variance : (sigma)^2/sample size(n) = (1/0.2)^2/40 = 0.625
   Simulation variance : var(mns) = 0.6199

3.

With increase in sample size distribution become normal

Excersize 2: Basic inferential Data Analysis

1. Load the ToothGrowth data and perform some basic exploratory data analyses
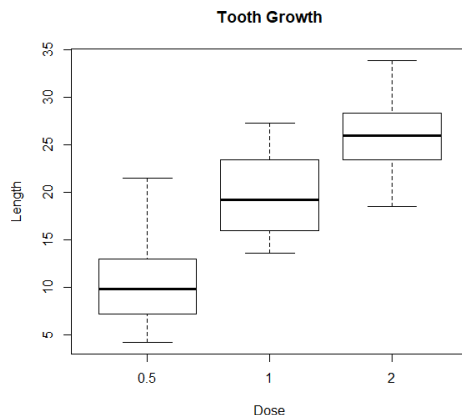
```
summary(ToothGrowth)
      len            supp          dose
 Min.   : 4.20   OJ:30    Min.   :0.500
 1st Qu.:13.07   VC:30    1st Qu.:0.500
 Median :19.25            Median :1.000
 Mean   :18.81            Mean   :1.167
 3rd Qu.:25.27            3rd Qu.:2.000
 Max.   :33.90            Max.   :2.000

> 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 ...
```

2. Exploratory of data with using box plot

boxplot(len~supp+dose,data = ToothGrowth,xlab = "Dose-Supp",ylab = "Length",main="Tooth Growth")

Increase in doses helps to increase tooth growth. Following T test also evident that p value less than 0.05. hence dose helps for tooth growth.

```
> Toothdose <- subset(ToothGrowth, ToothGrowth$dose %in% c(0.5,2.0))
> t.test(len~dose,data=Toothdose)

        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
```
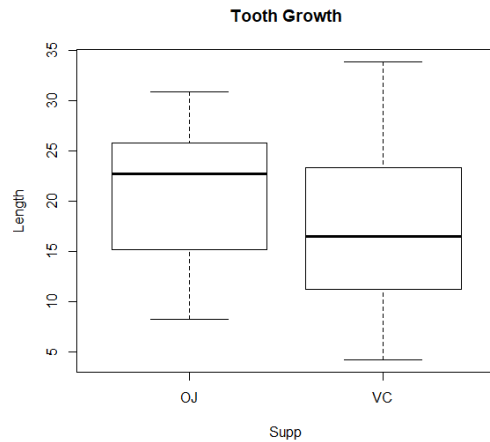
Tooth Growth

OJ supplement is better than VC for tooth growth

```
> 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
```

Supplement type helps for tooth growth but effect is very minimal as p value is more that 0.05. conclusion is that there is that supplement type does not show visible tooth growth.