Assignment 1

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Objective : To investigate the exponential distribution in R and compare it with the Central Limit Theorem

```r
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.2.2
```

```r
# set seed for reproducible research

set.seed(22)

# set constants
# lambda for reg expression
lambda_c <- 0.2
# no of exponential

n <- 40
# number of simulation
no_of_simulation <- 1000

# simulation
simulated_exponentials <- replicate(no_of_simulation, rexp(n, lambda_c))

# calculate mean of exponentials
means_exponentials <- apply(simulated_exponentials, 2, mean)

# Test the properties of the distribution

##Question 1
#Sample Mean versus Theoretical Mean:

### distribution of mean
distribution_mean <- mean(means_exponentials)
print("Distribution mean",distribution_mean)
```
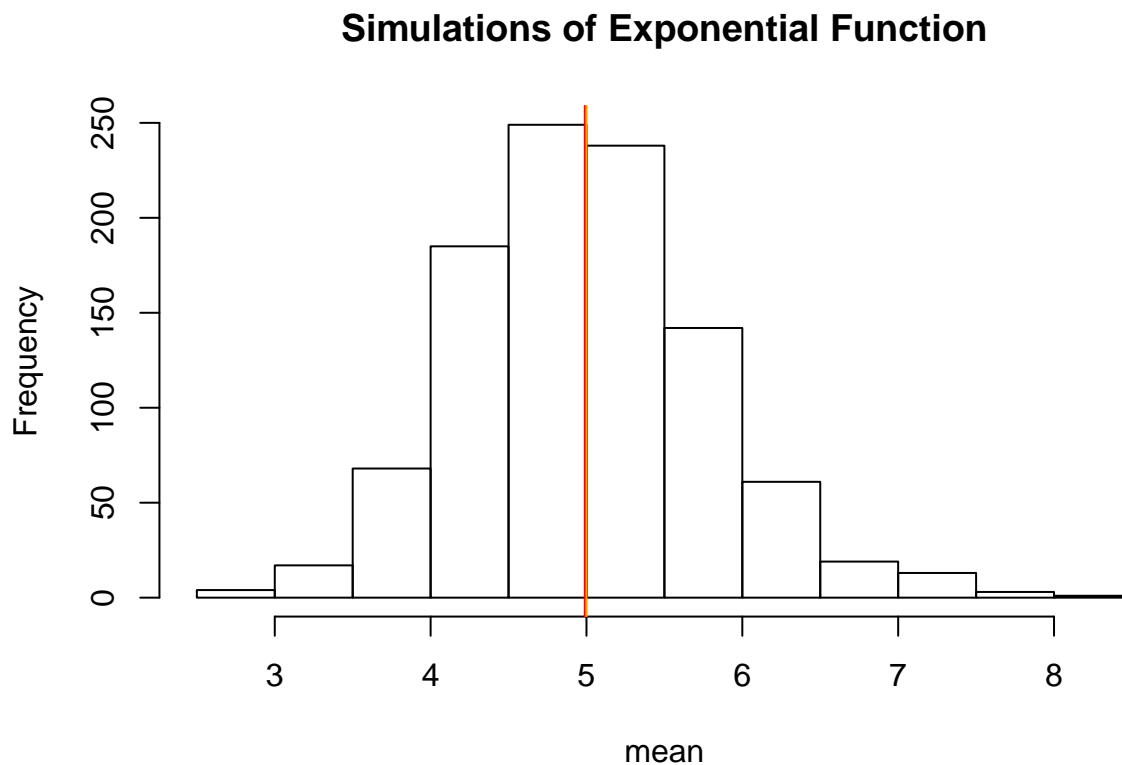
```
## [1] "Distribution mean"
```

```r
# analytical mean
theory_mean <- 1/lambda_c
print("theoritical_mean")
```

```
## [1] "theoritical_mean"
```

```
theory_mean
```

```
## [1] 5
```

```
# Exploratory analysis
# visualization
hist(means_exponentials, xlab = "mean", main = "Simulations of Exponential Function")
abline(v = distribution_mean, col = "red")
abline(v = theory_mean, col = "orange")
```

Simulations of Exponential Function


```
##Answer: The centre of the distribution of analytical and theoritical_mean are very close.
```

```
# Sample Variance versus Theoretical Variance:
```

```
x_axis <- seq(min(means_exponentials), max(means_exponentials), length=100)
y_axis <- dnorm(x_axis, mean=1/lambda_c, sd=(1/lambda_c/sqrt(n)))
hist(means_exponentials,breaks=n,prob=T,col="blue",xlab = "means",main="Density of means",ylab="Means de
lines(x_axis, y_axis, pch=22, col="red", lty=3)
```
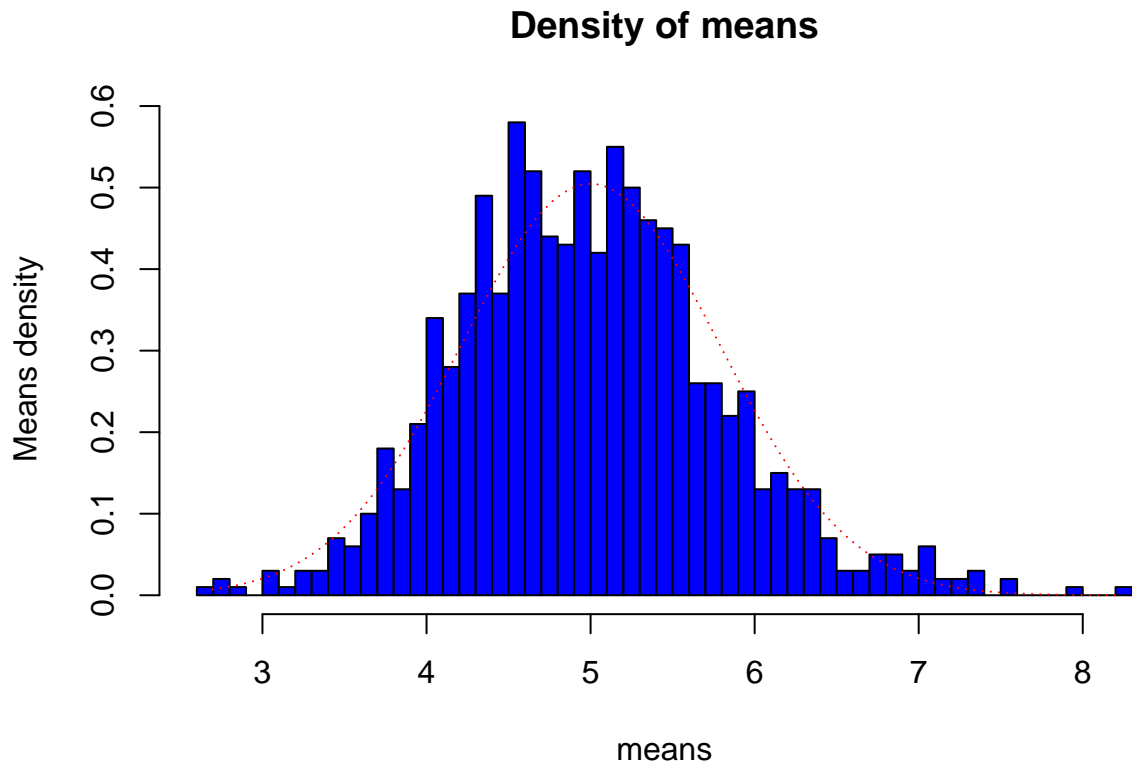
Density of means

##The distribution is normal, as the theoretical mean is 5 and the calculated mean is close to the theoritical mean as depicted in the density of means figure as above. This proves the central limit theorm as the theoretical mean and the sample mean reaches close as the sample size n increases or large.

Note that the `echo = FALSE` parameter was added to the code chunk to prevent printing of the R code that generated the plot.