Exponential distribution in R

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Overview: In this project you will investigate the exponential distribution in R and compare it with the Central Limit Theorem.

1. Sample mean (simulation) VS theoretical mean (calculation)

```r
simulation <- function(){
    set.seed(5)
    lambda <- 0.2
    n <- 40
    total <- 1000

    ##Simulate
    simulated <- replicate(total,rexp(n, lambda))

    ##Calculate the mean of 40
    simulated_means <- apply(simulated, 2, mean)

    ##Get the experimental mean
    experimental_mean <- mean(simulated_means)

    st1 <- paste('Sample mean =',experimental_mean,sep = ' ')

    print(st1)
}
```

The response of this function is:

```
[1] "Sample mean=4.9997019268744"
```

The theoretical mean is:

```
1/0.2
[1] 5
```

The sample center mean is very close to the theoretical center mean.

2. Show how variable the sample is (via variance) and compare it to the theoretical variance of the distribution.

Theoretical variance:

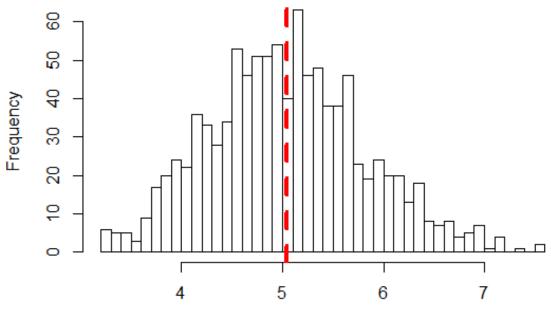```
(1/lambda)^2/40
[1] 0.625
```

Sample variance:

```
"Sample variance = 0.602604708900425"
```

3. Show that the distribution is approximately normal.

```r
simulation3 <- function(){
    set.seed(5)
    lambda <- 0.2
    n <- 40
    total <- 1000

    ##Simulate
    simulated <- replicate(total,rexp(n, lambda))

    ##Calculate the mean of 40
    simulated_means <- apply(simulated, 2, mean)

    ##Draw the histogram
    hist(as.numeric(simulated_means),breaks=50,main="1000 runs of 40
exponential distributions",xlab="mean of exponential distribution")
    mean_sim <- mean(simulated_means)

    ##Add the mean
    abline(v=mean_sim, col="red", lwd=4, lty=20)

}
```

1000 runs of 40 exponential distributions