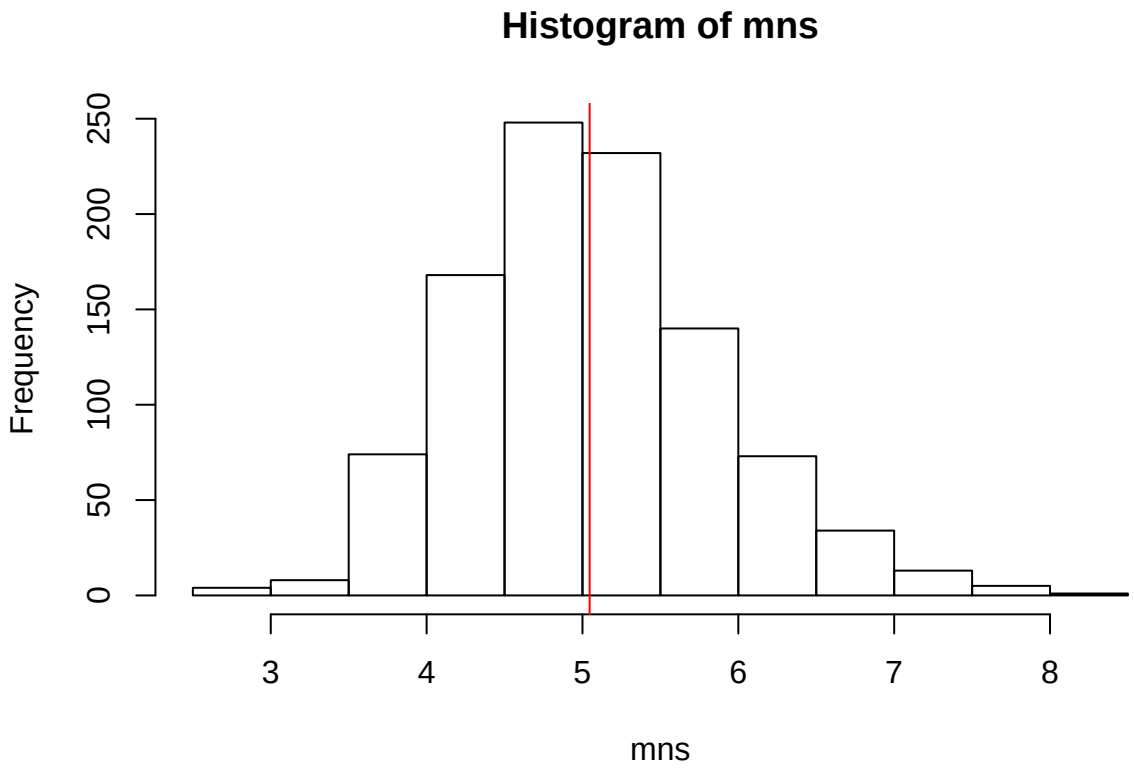
Overview: In this simulation I am trying to simulate the exponential distribution. rexp(n,lambda). The mean of rexp is 1/lambda The sd of rexp is 1/lambda

In this simulation, lambda = 2.

Sample Mean versus Theoretical Mean:

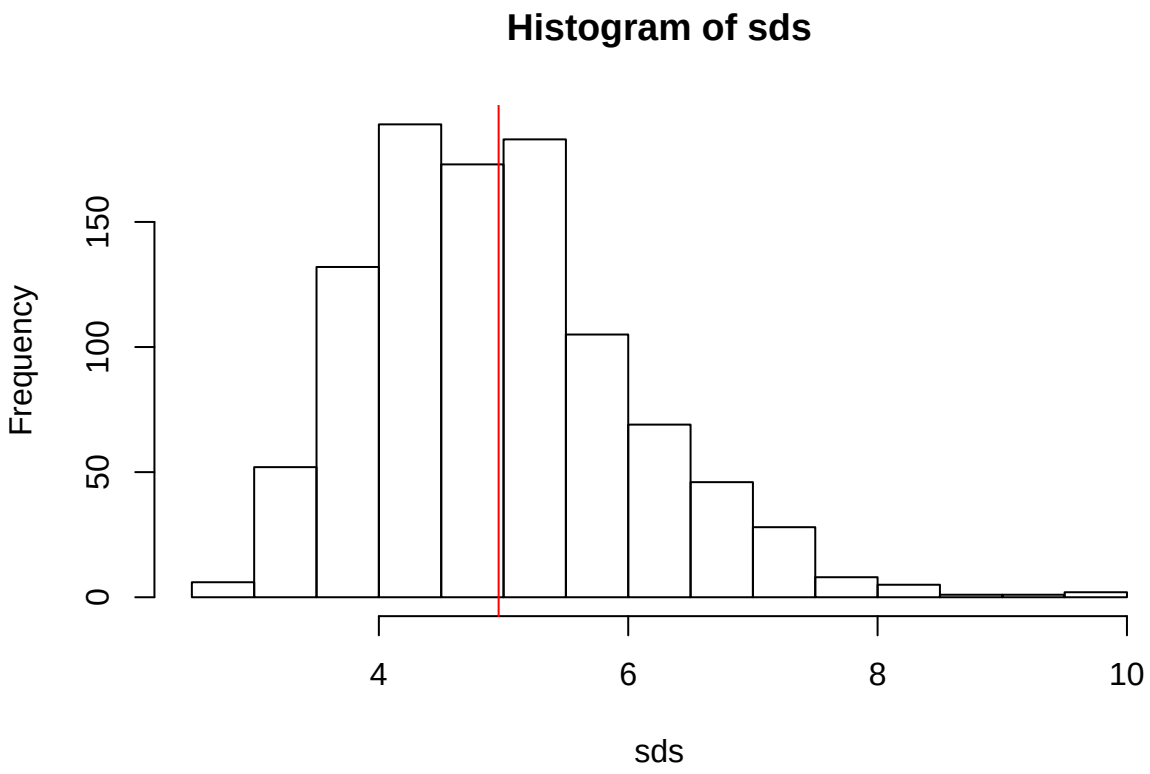
```
suppressPackageStartupMessages(library(ggplot2))
lambda<-2
mns<-NULL
for (i in 1 : 1000) mns<-c(mns, mean(rexp(40,0.2)))
hist(mns)
abline(v=mean(mns),col='red')
```



So our simulated mean is mean(mns) = 5.0459753 And the theoretical mean is 0.5

Sample Variance versus Theoretical Variance: Include figures (output from R) with titles. Highlight the variances you are comparing. Include text that explains your understanding of the differences of the variances.

```
sds<-NULL
for (i in 1 : 1000) sds<-c(sds, sd(rexp(40,0.2)))
hist(sds)
abline(v=mean(sds),col='red')
```

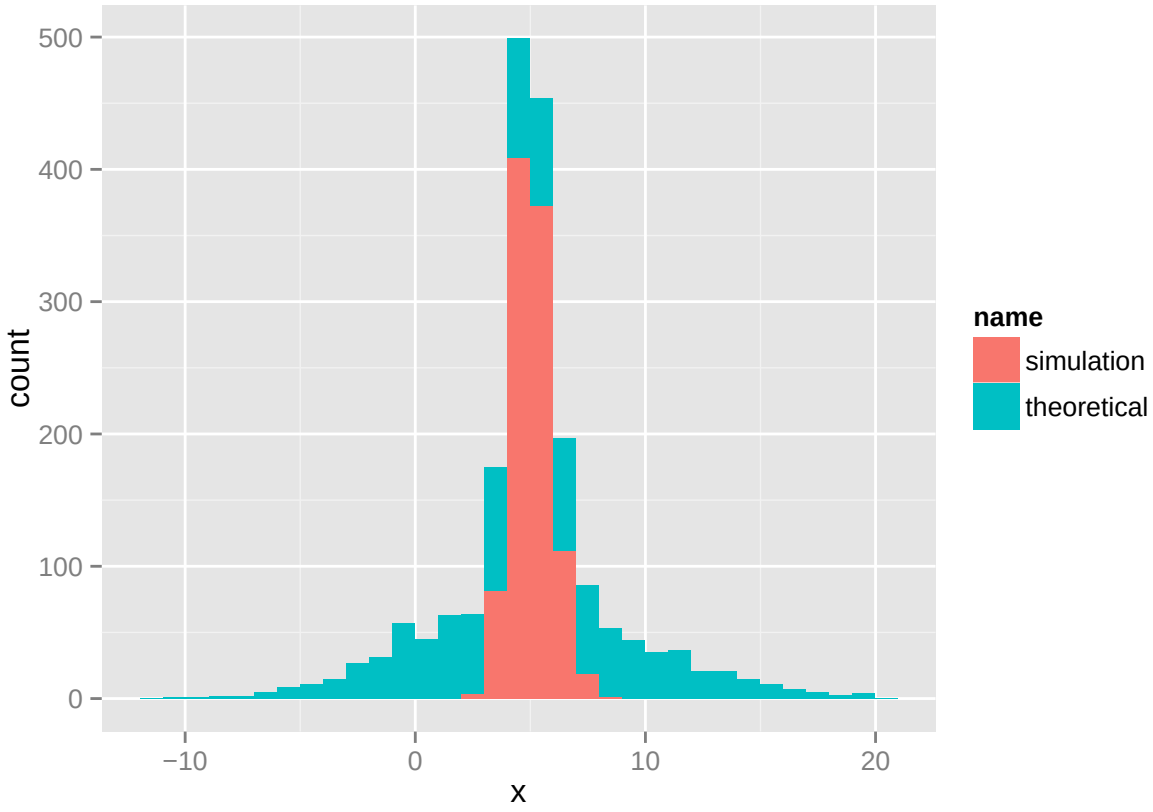


So our simulated variance is mean(sds) = 4.9606285 And the theoretical sd is 0.5

Distribution: To check if mns is approximate normal distribution, we plot mns of rnorm(n=1000, mean=5, sd=5) in the same graph.

```
d1<-data.frame(x=mns,name="simulation")
d2<-data.frame(x=rnorm(1000,mean=5,sd=5),name="theoretical")
d<-rbind(d1,d2)
ggplot(d,aes(x=x, fill=name))+geom_histogram()
```

```
## stat_bin: binwidth defaulted to range/30. Use 'binwidth = x' to adjust this.
```



From the plot, we can see the means of exp distribution is approximate normal distribution.