# Appendix Course Project - Statistical Inference

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This appendix documents the code required to reproduce the analysis for the course project.

## Simulation Code

```
lambda<-0.2
samplesize<-40
nreps<-1000
samplemeans<-rep(0,nreps)

for (i in 1:nreps) {
  tempsample<-rexp(samplesize,lambda)
    samplemeans[i]<-mean(tempsample)
}
```

## Distribution centrality

## Calculate

```
#sample (mean)
mean(samplemeans)
#theory (mean)
theo_mean<-1/lambda
theo_mean
```

## Plot densities

```
hist(samplemeans,breaks=20,col="red",freq=FALSE,xlab="Sample
means",main="Density of sample means (red),\n with theoretical density
(blue)")
xfit<-seq(min(samplemeans),max(samplemeans),length=samplesize)
yfit<-dnorm(xfit,mean=1/lambda,sd=1/(lambda*sqrt(samplesize)))
lines(xfit, yfit, col="blue", lwd=2)
```

## Distribution variability

### calculate

```
#sample (variability about mean)
var(samplemeans)
#theory (variability about mean)
theo_var_about_mean<-1/(samplesize*lambda^2)
theo_var_about_mean
```

## Distribution normality

### Plot qq plot

```
qqnorm(samplemeans,ylab="Sample means from simulation");
qqline(samplemeans, col = 2)
```

### Plot densities

```
sample2<-rexp(nreps,lambda)
y<-c(samplemeans,sample2)
x<-c(rep("Mean of sample",nreps),rep("Single sample",nreps))
xy_df<-data.frame(x,y)
library(lattice)
histogram(~ y | as.factor(x),xlab="Sample value",main="Density of means
of many samples (left)\n and a single sample (right)")
```