

Statistical Inference Course Project – Part I

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This is the first of two reports for the Statistical Inference Course Project.

This report explores the exponential distribution. The exponential distribution $p(x) = \lambda e^{-\lambda x}$ It has a mean of $1/\lambda$ and a standard deviation of $1/\lambda$.

In R we can use the function `rexp(n, lambda)` to simulate the exponential distribution. We take 40 observations 1000 times with $\lambda = 0.2$.

```
lambda = 0.2
trials <- lapply(1:1000, function(i) rexp(40, lambda))
```

We can then take the means of each of these trials

```
trial_means <- sapply(trials, mean)
```

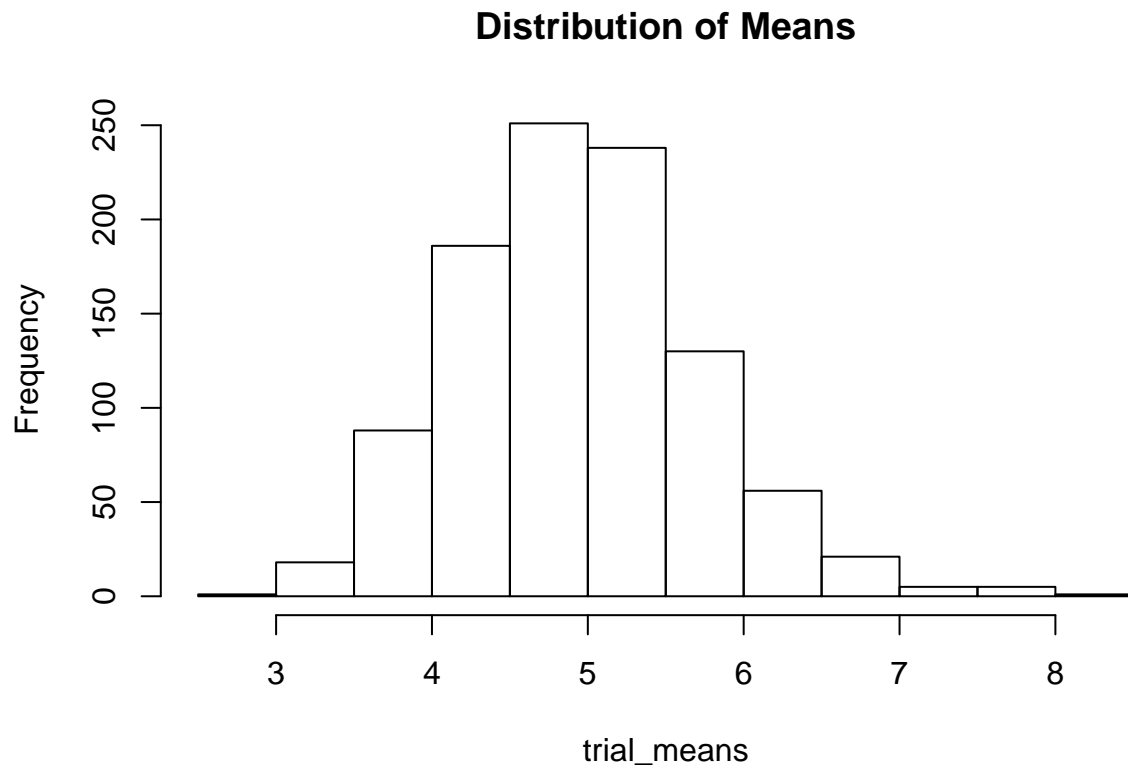
These trial means should be centered at the theoretical mean. So we expect the median of the `trial_means` to be about 5.

The standard deviation of these means should be about the theoretical standard error, which is the distribution's standard deviation divided by the square root of the number of observations, which in this case is 40.

The theoretical mean is 5 and the trial means are centered at 4.9029 so that checks out. The standard error is 0.7906 and standard deviation of the trial means is 0.7789 so that also checks out.

The trial means are approximately normally distributed. We can see this by looking at a histogram of the trial means.

```
hist(trial_means, main="Distribution of Means")
```



See, normal distribution.