Assignment-2

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```r
#to calculate MLE of the parameter lambda in the zero truncated Poisson distribution
#input the data for the random variable
#rep(x,n) gives n times the r.v x has been repeated

sights  <-  c(rep(1,11),rep(2,13),rep(3,5),4,5,rep(7,2))

#get the size of the sample
n<-length(sights)
#define the log-likelihood function as follows
loglike<-function(lamda,sights){
  -n*log(exp(lamda)-1)+n*mean(sights)*log(lamda)
}
# Find maximum likelihood estimate(MLE) of lambda
lambda_MLE <- optimize(loglike, c(0, 33), sights, maximum = TRUE)$maximum
lambda_MLE
```

```
## [1] 1.949087
```

```r
#estimating the total number of females using
#the Horvitz-Thompson estimator
N<-n/(1-exp(-lambda_MLE))
N
```

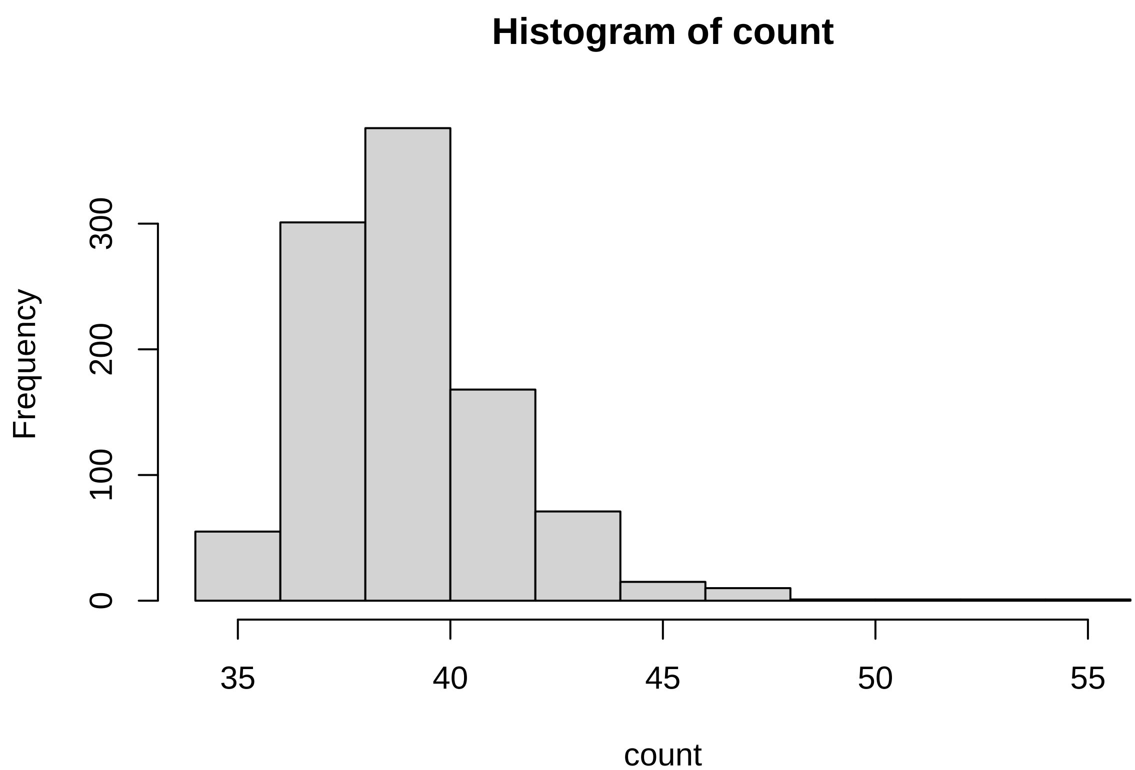
```
## [1] 38.47966
```

```r
#Use parametric bootstrap to compute a confidence interval
#of the total number of females (N)

nsim<-1000 #setting the number of simulation
#we will do simulation for computing the parameter lambda
lambdab<-numeric( nsim) #create a vector to store data

for (i in 1:nsim){

  sightsb <- sample (sights , n, replace =T)

  # Obtaining parameter estimates via bootstrap
  lambdab[i] <- optimize(loglike, c(0, 33), sightsb, maximum = TRUE)$maximum

}
```

```r
# Using Horvitz-Thompson estimator to obtain total number of females
count <-n/(1-exp(-lambdab))
# Bootstrap estimate of total number of females(N)
Nb<-mean(count)
Nb
```

```
## [1] 39.03202
```

```r
hist(count)
```




```r
# Calculating 95% confidence interval for N
quantile(count, probs = c(0.025, 0.975))
```

```
##     2.5%    97.5%
## 35.51811 44.64284
```