```r
setwd("C:\\Users\\akmal\\Desktop\\2.1\\PS\\week8\\OneDrive_2025-09-25\\IT24100444Lab 08")

getwd()

#Calculate population mean and variance

data<- read.table("Data - Lab 8.txt",header= TRUE)

fix(data)

attach(data)

#Question 01

# mean and var for data

popmean<-mean(Nicotine)

popvar<-var(Nicotine)

#Question 02

#Get 30 random samples of size 5,

#replacement and calculate sample mean and sample variance

samples<-c()

n<-c()

# assing samples of size 5 for samples variable

for(i in 1:30){

  s<-sample(Nicotine,5,replace=TRUE) # sample command

  samples<-cbind(samples,s)

  n<-c(n,paste('S',i))

}
```

```r
# assing column name for each sample created

colnames(samples)=n

s.means<-apply(samples,2,mean)

s.vars<-apply(samples,2,var)

#Question 03

#Calculate mean and variance of the Sample Means

samplemean<-mean(s.means)

samplevars<-var(s.means)

#Question 04

#Compare and state relationship Population Mean and the Mean of Sample means

popmean

samplemeans

#Question 05

#Compare and state relationship Population Variance and the Variance of

#Sample Means.

truevar=popvar/5

truevar

samplevars


##Exercise

#Part 1

data2<-read.table("Exercise - LaptopsWeights.txt",header=TRUE)

fix(data)

attach(data2)

# question 1

pop_mean<-mean(Weight.kg.)
```

```r
pop_sd<-sd(Weight.kg.)

cat("Population Mean (True Mean):",pop_mean,"\n")

cat("Population Standard Deviation (True SD):",pop_sd,"\n")

# Question 2

samples<-c()

sample_names <- c()

for (i in 1:25){

  S <- sample(Weight.kg.,6,replace =TRUE)

  samples <- cbind(samples,S)

  sample_names<-c(sample_names, paste('S',i))

}

colnames(samples)= sample_names

s.means<-apply(samples,2,mean)

s.sds<-apply(samples,2,sd)


#Question 3


samplemean<-mean(s.means)

samplesd<-sd(s.means)


pop_mean

pop_sd


truesd=pop_sd/6

samplesd
```

```
> setwd("C:\\Users\\akmal\\Desktop\\2.1\\PS\\week8\\OneDrive_2025-09-25\\IT24100444Lab
08")
> getwd()
[1] "C:/Users/akmal/Desktop/2.1/PS/week8/OneDrive_2025-09-25/IT24100444Lab 08"
> data<- read.table("Data - Lab 8.txt",header= TRUE)
> fix(data)
> attach(data)
> popmean<-mean(Nicotine)
> popmean<-mean(Nicotine)
> popvar<-var(Nicotine)
> #Question 02
> samples<-c()
> n<-c()
> for(i in 1:30){
+    s<-sample(Nicotine,5,replace=TRUE)
+    samples<-cbind(samples,s)
+    n<-c(n,paste('S',i))
+ }
> colnames(samples)=n
> s.means<-apply(samples,2,mean)
> s.vars<-apply(samples,2,var)
> #Question 03
> samplemean<-mean(s.means)
> samplevars<-var(s.means)
> #Question 04
> popmean
[1] 1.77425
> samplemean
[1] 1.779467
> #Question 05
> truevar=popvar/5
> truevar
[1] 0.03049117
> samplevars
[1] 0.0298866
> data2<-read.table("Exercise - LaptopsWeights.txt",header=TRUE)
> fix(data)
> attach(data2)
> #1
> pop_mean<-mean(Weight.kg.)
> pop_sd<-sd(Weight.kg.)
> cat("Population Mean (True Mean):",pop_mean,"\n")
Population Mean (True Mean): 2.468
> cat("Population Standard Deviation (True SD):",pop_sd,"\n")
Population Standard Deviation (True SD): 0.2561069
```

```
> s.vars<-apply(samples,2,var)
> #Question 03
> samplemean<-mean(s.means)
> samplevars<-var(s.means)
> #Question 04
> popmean
[1] 1.77425
> samplemean
[1] 1.779467
> #Question 05
> truevar=popvar/5
> truevar
[1] 0.03049117
> samplevars
[1] 0.0298866
> data2<-read.table("Exercise - LaptopsWeights.txt",header=TRUE)
> fix(data)
> attach(data2)
> #1
> pop_mean<-mean(Weight.kg.)
> pop_sd<-sd(Weight.kg.)
> cat("Population Mean (True Mean):",pop_mean,"\n")
Population Mean (True Mean): 2.468
> cat("Population Standard Deviation (True SD):",pop_sd,"\n")
Population Standard Deviation (True SD): 0.2561069
> #2
> samples<-c()
> sample_names <- c()
> for (i in 1:25){
+    S <- sample(Weight.kg.,6,replace =TRUE)
+    samples <- cbind(samples,S)
+    sample_names<-c(sample_names, paste('S',i))
+ }
> colnames(samples)= sample_names
> s.means<-apply(samples,2,mean)
> s.sds<-apply(samples,2,sd)
> samplemean<-mean(s.means)
> samplesd<-sd(s.means)
> pop_mean
[1] 2.468
> pop_sd
[1] 0.2561069
> truesd=pop_sd/6
> samplesd
```

Data		
▶ data	40 obs. of 1 variable	▦
▶ data2	40 obs. of 1 variable	▦
samples	num [1:6, 1:25] 2.2 2.71 2.65 2.76 2.05 2.6 1.71 2.32 2.85 1.71 …	▦
Values		
i	25L	
n	chr [1:30] "S 1" "S 2" "S 3" "S 4" "S 5" "S 6" "S 7" "S 8" "S 9" "…	
pop_mean	2.468	
pop_sd	0.256106948813907	
popmean	1.77425	
popvar	0.152455833333333	
s	num [1:5] 2.28 1.58 1.4 1.79 1.93	
S	num [1:6] 2.71 2.06 2.17 2.2 2.32 2.57	
s.means	Named num [1:25] 2.5 2.33 2.47 2.47 2.34 …	
s.sds	Named num [1:25] 0.295 0.513 0.22 0.232 0.231 …	
s.vars	Named num [1:30] 0.0498 0.1789 0.0187 0.1865 0.1754 …	
sample_names	chr [1:25] "S 1" "S 2" "S 3" "S 4" "S 5" "S 6" "S 7" "S 8" "S 9" "…	
samplemean	2.45586666666667	
samplesd	0.0959047077205439	
samplevars	0.0298866022988506	
truesd	0.0426844914689845	
truevar	0.0304911666666667	