SLIIT UNI
THE KNOWLEDGE UNIVERSITY

Faculty of Computing
Year 2 Semester 1 (2025)

IT2120 - Probability and Statistics Lab Sheet 08

Before starting the lab sheet, you need to create a folder in your desktop and save all your working inside the folder. Set the working directory to that folder using the following command:

setwd("paste the path of the folder")

Eg:- setwd("D:\\2025 - Sem 2\\IT2120\\Lab Sessions\\Lab 08")

The nicotine contents, in milligrams for 40 cigarettes of a certain brand (population) were recorded.

1. Calculate population mean and variance of the dataset.

```
##Setting the directory
setwd("D:\\2025 - Sem 2\\IT2120 - New\\Lab Sessions\\Lab 08")

##Importing the data set
data<-read.table("Data - Lab 8.txt",header=TRUE)
fix(data)
attach(data)

##Question 01
#Commands "mean" & "var" will compute the mean and variance for data.
popmn<-mean(Nicotine)
popvar<-var(Nicotine)
```

2. Get 30 random samples of size 5, with replacement and calculate sample mean and sample variance for each sample.

```
##Question 02
#First create null vectors to store sample data sets.
samples<-c()
n<-c()
#The "for" loop will be used to create and assign samples of size 5 for "samples" variable created above.
#Using "sample" command we can draw a random sample either with replacement or without replacement.
#By making "replace" argument as TRUE we can create samples with replacement.
for(i in 1:30){
  s<-sample(Nicotine,5,replace=TRUE)
  samples<-cbind(samples,s)
  n<-c(n,paste('S',i))
}
#Assign column names for each sample created. Names have stored earlier under "n" variable.
colnames(samples)=n
#Using "apply" command we can ask to calculate any function such as mean, variance, etc. row wise or
#column wise in a matrix.
#Here, considering the second argument as "2" we can calculate either mean/variance column wise
#which stored earlier in "samples" variable which is a matrix.
s.means<-apply(samples,2,mean)
s.vars<-apply(samples,2,var)
```

3. Calculate mean and variance of the Sample Means.

```
##Question 03
#Following commands will calculate mean and variance of sample means stored in "s.means" variable.
samplemean<-mean(s.means)
samplevars<-var(s.means)
```

4. Compare and state relationship (if any) Population Mean and the Mean of Sample Means.

```
#Question 04
#Compare the population mean and mean of sample means.
popmn
samplemean
```

5. Compare and state relationship (if any) Population Variance and the Variance of Sample Means.

```
#Question 05
#Compare the population variance and variance of sample means.
truevar=popvar/5
samplevars
```

Use the Following Format:

Sample	Mean	Variance
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Sample	Mean	Variance
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

Population Mean	
Population Variance	
Mean of the Sample Means	
Variance of Sample Means	

Exercise

Instructions: Create a folder in your desktop with your registration number (Eg: "IT....."). You need to save the R script file and take screenshots of the command prompt with answers and save it in a word document inside the folder. Save both R script file and word document with your registration number (Eg: "IT....."). After you finish the exercise, zip the folder and upload the zip file to the submission link.

1. Calculate the population mean and population standard deviation of the laptop bag weights.
2. Draw 25 random samples of size 6 (with replacement) and calculate the sample mean and sample standard deviation for each sample.
3. Calculate the mean and standard deviation of the 25 sample means and state the relationship of them with true mean and true standard deviation.

```
Console  Terminal  Background Jobs
R 4.5.1 · C:/Users/Geenuth/2nd Year 1st Semester/Probability and Statistics(IT2120)/Practical/Lab 8/
> setwd("C://Users//Geenuth//2nd Year 1st Semester//Probability and Statistics(IT2120)//Practical//
Lab 8")
> getwd()
[1] "C:/Users/Geenuth/2nd Year 1st Semester/Probability and Statistics(IT2120)/Practical/Lab 8"
>
> #Exercise
> #Question 01
> data <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
> weights <- data$Weight.kg.
>
> pop_mean <- mean(weights)
> pop_sd <- sd(weights)
>
> pop_mean
[1] 2.468
```

```
Console  Terminal  Background Jobs
R 4.5.1 · C:/Users/Geenuth/2nd Year 1st Semester/Probability and Statistics(IT2120)/Practical/Lab 8/
> pop_sd
[1] 0.2561069
>
> #Question 02
> set.seed(123)
>
> samples <- matrix(nrow = 6, ncol = 25)
>
> for (i in 1:25) {
+   samples[, i] <- sample(weights, size = 6, replace = TRUE)
+ }
>
> s_means <- apply(samples, 2, mean)
> s_sds <- apply(samples, 2, sd)
>
```

```
Console  Terminal  Background Jobs
R 4.5.1 · C:/Users/Geenuth/2nd Year 1st Semester/Probability and Statistics(IT2120)/Practical/Lab 8/
> s_means
 [1] 2.530000 2.573333 2.473333 2.591667 2.456667 2.401667 2.590000 2.466667 2.401667 2.335000
[11] 2.586667 2.378333 2.381667 2.465000 2.485000 2.451667 2.385000 2.338333 2.428333 2.551667
[21] 2.538333 2.466667 2.470000 2.448333 2.475000
> s_sds
 [1] 0.1513935 0.1191078 0.1718914 0.1345239 0.2749303 0.2544340 0.2167026 0.4530195 0.2230172
[10] 0.3237746 0.1706068 0.3235686 0.2993604 0.2314951 0.1745566 0.2762909 0.2042303 0.2436733
[19] 0.2481465 0.2654367 0.1708118 0.2451666 0.2405826 0.2792430 0.2358601
>
> #Question 03
> mean_of_sample_means <- mean(s_means)
> sd_of_sample_means <- sd(s_means)
>
> mean_of_sample_means
[1] 2.4668
```

```
> sd_of_sample_means
[1] 0.07624874
>
> pop_mean
[1] 2.468
> pop_sd
[1] 0.2561069
>
```