Sri Lanka Institute of Information Technology

Lab Submission

Lab Sheet 08

IT24102699
Mummullage B.U.T

Probability and Statistics| IT2120

B.Sc.(Hons) in Information Technology

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.

```
 8
 9  getwd()
10  setwd("F:\\SLIIT\\_Year_02_\\Semester 01\\PS - Probability and Statistics\\Lab Practicals\\Lab 08\\IT24102699")
11  getwd()
12
13
14
15  # Question 01
16
17  laptops <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
18
19  attach(laptops)
20
21  pop_mean <- mean(Weight.kg.)
22  print(paste("Population Mean:", pop_mean))
23
24  n <- length(Weight.kg.)
25  pop_var <- var(Weight.kg.) * (n - 1) / n
26  pop_sd <- sqrt(pop_var)
27
28  print(paste("Population Standard Deviation:", pop_sd))
29
30
31
32
30:1  (Top Level)
```

```
Console  Terminal  Background Jobs
R 4.5.1 · F:/SLIIT/_Year_02_/Semester 01/PS - Probability and Statistics/Lab Practicals/Lab 08/IT24102699/
[1] "C:/Users/UsEr/Documents"
> setwd("F:\\SLIIT\\_Year_02_\\Semester 01\\PS - Probability and Statistics\\Lab Practicals\\Lab 08\\IT24102699")
> getwd()
[1] "F:/SLIIT/_Year_02_/Semester 01/PS - Probability and Statistics/Lab Practicals/Lab 08/IT24102699"
> laptops <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
> attach(laptops)
>
> pop_mean <- mean(Weight.kg.)
> print(paste("Population Mean:", pop_mean))
[1] "Population Mean: 2.468"
>
> n <- length(Weight.kg.)
> pop_var <- var(Weight.kg.) * (n - 1) / n
> pop_sd <- sqrt(pop_var)
>
> print(paste("Population Standard Deviation:", pop_sd))
[1] "Population Standard Deviation: 0.252885349516337"
>
```

2. Draw 25 random samples of size 6 (with replacement) and calculate the sample mean and sample standard deviation for each sample.

```r
# Question 02

sample_means <- c()
sample_sds <- c()

for (i in 1:25) {
  s <- sample(Weight.kg., size = 6, replace = TRUE)
  sample_means <- c(sample_means, mean(s))
  sample_sds <- c(sample_sds, sd(s))
}

results_table <- data.frame(
  Sample_Number = 1:25,
  Mean = sample_means,
  Standard_Deviation = sample_sds
)

print("25 Sample Means and Standard Deviations")
print(results_table)
```

46:34 (Top Level)

Console Terminal Background Jobs

R 4.5.1 · F:/SLIIT/_Year_02_/Semester 01/PS - Probability and Statistics/Lab Practicals/Lab 08

```
> # Question 02
>
> sample_means <- c()
> sample_sds <- c()
>
> for (i in 1:25) {
+   s <- sample(Weight.kg., size = 6, replace = TRUE)
+   sample_means <- c(sample_means, mean(s))
+   sample_sds <- c(sample_sds, sd(s))
+ }
>
> results_table <- data.frame(
+   Sample_Number = 1:25,
+   Mean = sample_means,
+   Standard_Deviation = sample_sds
+ )
```

46:34 (Top Level)

Console Terminal Background Jobs

R 4.5.1 · F:/SLIIT/_Year_02_/Semester 01/PS - Probability and Statistics/Lab Practicals/Lab 08/IT24102699/

```
> print("25 Sample Means and Standard Deviations")
[1] "25 Sample Means and Standard Deviations"
> print(results_table)
   Sample_Number     Mean Standard_Deviation
1              1 2.490000          0.1181524
2              2 2.310000          0.3879691
3              3 2.415000          0.2864088
4              4 2.493333          0.2991098
5              5 2.635000          0.1578290
6              6 2.703333          0.1608312
7              7 2.443333          0.3929207
8              8 2.405000          0.1899210
9              9 2.603333          0.1684834
10            10 2.370000          0.2760435
11            11 2.545000          0.4104997
12            12 2.588333          0.1752046
13            13 2.551667          0.2428511
14            14 2.478333          0.2757112
15            15 2.565000          0.2078220
16            16 2.438333          0.2036091
17            17 2.620000          0.1979899
18            18 2.578333          0.1670230
19            19 2.410000          0.1862257
20            20 2.431667          0.2086544
21            21 2.650000          0.1050714
22            22 2.411667          0.1863778
23            23 2.420000          0.2836195
24            24 2.553333          0.1561623
25            25 2.521667          0.2563136
>
```

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.

```
53
54  # Question 03
55
56  mean_of_sample_means <- mean(sample_means)
57  sd_of_sample_means <- sd(sample_means)
58
59  print(paste("Mean of Sample Means:", mean_of_sample_means))
60  print(paste("Population Mean:", pop_mean))
61  print("The mean of the sample means is approximately equal to the population mean.")
62
63  print(paste("SD of Sample Means:", sd_of_sample_means))
64  print(paste("Population SD / sqrt(n):", pop_sd / sqrt(6)))
65
66  print("The standard deviation of the sample means is approximately equal to the population standard deviation divided by the square root of the sample size.")
67
61:21  (Top Level) :
```

```
Console  Terminal  Background Jobs
R 4.5.1 · F:/SLIIT/_Year_02_/Semester 01/PS - Probability and Statistics/Lab Practicals/Lab 08/IT24102699/
> # Question 03
>
> mean_of_sample_means <- mean(sample_means)
> sd_of_sample_means <- sd(sample_means)
>
> print(paste("Mean of Sample Means:", mean_of_sample_means))
[1] "Mean of Sample Means: 2.4918"
> print(paste("Population Mean:", pop_mean))
[1] "Population Mean: 2.468"
> print("The mean of the sample means is approximately equal to the population mean.")
[1] "The mean of the sample means is approximately equal to the population mean."
>
> print(paste("SD of Sample Means:", sd_of_sample_means))
[1] "SD of Sample Means: 0.102090328558513"
> print(paste("Population SD / sqrt(n):", pop_sd / sqrt(6)))
[1] "Population SD / sqrt(n): 0.103240011623401"
>
> print("The standard deviation of the sample means is approximately equal to the population standard deviation divided by the square root of the sample size.")
[1] "The standard deviation of the sample means is approximately equal to the population standard deviation divided by the square root of the sample size."
>
```