

Sri Lanka Institute of Information Technology



Lab Submission
08

IT24103021

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Probability and Statistics - IT2120

B.Sc. (Hons) in Information Technology

Exercise

The screenshot shows the RStudio interface with the following components:

- Script Editor:** Contains the following R code:

```
1 # Question 1
2
3 # Set the working directory
4 setwd("C:\\Users\\Home\\Desktop\\IT24103021")
5
6 # Import the dataset
7 data <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
8 fix(data)
9 attach(data)
```
- Console:** Shows the output of the executed code:

```
> # Set the working directory
> setwd("C:\\Users\\Home\\Desktop\\IT24103021")
> # Import the dataset
> data <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
> fix(data)
> attach(data)
```
- Environment:** Displays the loaded objects:
 - `data`: 40 obs. of 1 variable
 - `samples`: num [1:6, 1:25] 2.53 2.46 2.6 2.6 2.89 2...
 - `student_data`: 30 obs. of 3 variables
- Values:** Shows the structure of the `data` object:

```
gender.freq.ex 'table' int [1:2(1d)] 15 15
i
n chr [1:25] "s 1" "s 2" "s 3" "s 4" "s 5" ...
popmn 2.468
popvar 0.0655907692307692
s num [1:6] 2.05 2.41 2.43 2.43 2.46 2.28
s.means Named num [1:25] 2.54 2.47 2.45 2.41 2.37 ...
s.vars Named num [1:25] 0.0608 0.0207 0.0159 0.01...
samplesmean 2.4718
samplesvars 0.00823979629629629
truevar 0.0109317948717949
```

1. Calculate the population mean and population standard deviation of the laptop bag weights.

The screenshot shows the RStudio interface with the following components:

- Script Editor:** Contains the following R code:

```
10
11 # Calculate the population mean of laptop bag weights
12 popmn <- mean(weight.kg.)
13 popmn
14
15 # Calculate the population variance
16 popvar <- var(weight.kg.)
17 popvar
18
```
- Console:** Shows the output of the executed code:

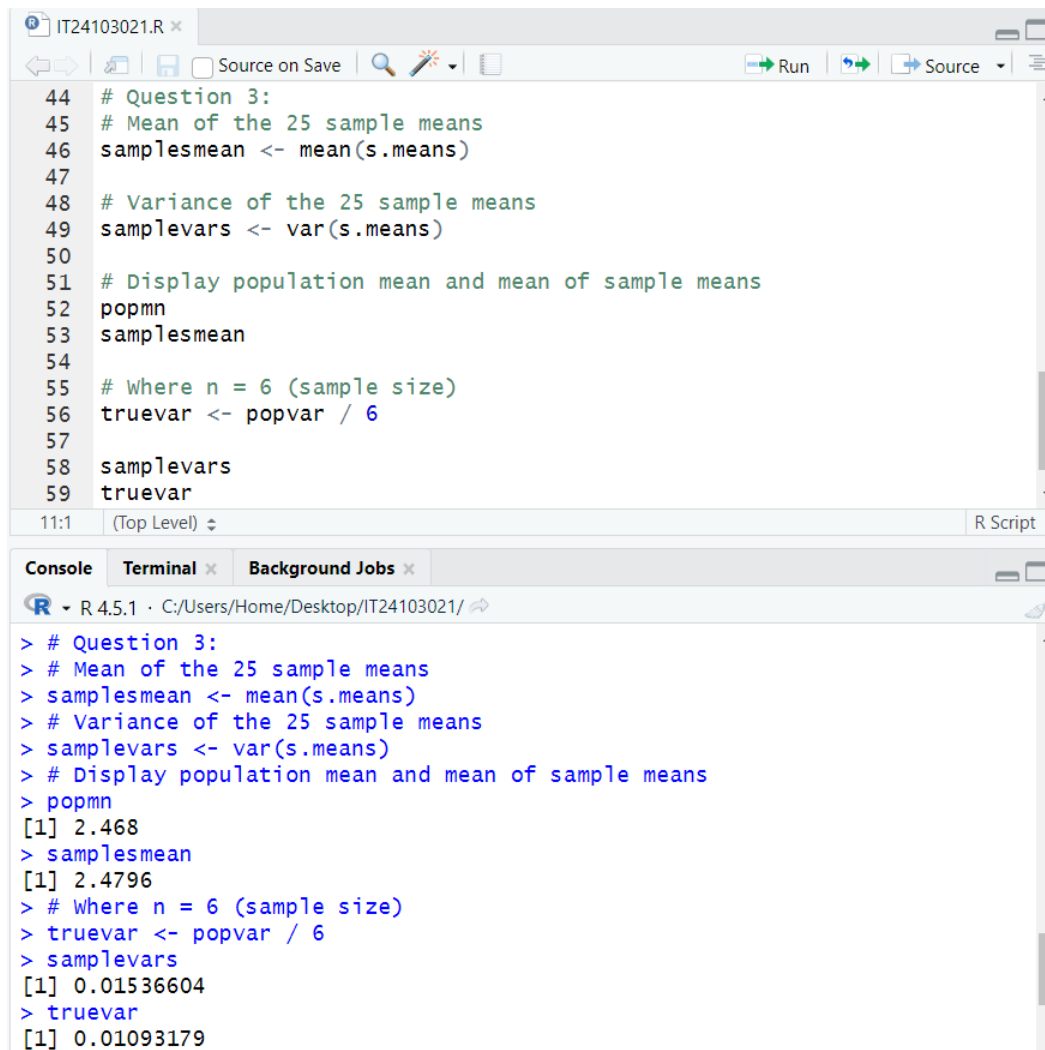
```
> # Calculate the population mean of laptop bag weights
> popmn <- mean(weight.kg.)
> popmn
[1] 2.468
> # Calculate the population variance
> popvar <- var(weight.kg.)
> popvar
[1] 0.06559077
```

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

```
IT24103021.R* x
Source on Save Run Source
20 # Question 2
21 # Initialize empty containers for samples and sample names
22 samples <- c()
23 n <- c()
24
25 # Loop to draw 25 samples of size 6 with replacement
26 for(i in 1:25){
27   s <- sample(weight.kg., 6, replace = TRUE) # Sample of size 6
28   samples <- cbind(samples, s)
29   n <- c(n, paste("s", i))
30 }
31
32 # Assign column names to the sample matrix
33 colnames(samples) <- n
34
35 # Calculate sample means and variances for each sample
36 s.means <- apply(samples, 2, mean)
37 s.vars <- apply(samples, 2, var)
38
39 s.means
40 s.vars
41
42:1 (Top Level) R Script
```

```
Console Terminal Background Jobs
R 4.5.1 C:/Users/Home/Desktop/IT24103021/
> # Question 2
> # Initialize empty containers for samples and sample names
> samples <- c()
> n <- c()
> # Loop to draw 25 samples of size 6 with replacement
> for(i in 1:25){
+   s <- sample(weight.kg., 6, replace = TRUE) # Sample of size 6
+   samples <- cbind(samples, s)
+   n <- c(n, paste("s", i))
+ }
> # Assign column names to the sample matrix
> colnames(samples) <- n
> # Calculate sample means and variances for each sample
> s.means <- apply(samples, 2, mean)
> s.vars <- apply(samples, 2, var)
> s.means
  s 1      s 2      s 3      s 4      s 5      s 6      s 7      s 8
2.356667 2.510000 2.411667 2.535000 2.316667 2.501667 2.511667 2.463333
  s 9      s 10     s 11     s 12     s 13     s 14     s 15     s 16
2.295000 2.396667 2.416667 2.566667 2.300000 2.540000 2.520000 2.391667
  s 17     s 18     s 19     s 20     s 21     s 22     s 23     s 24
2.515000 2.483333 2.448333 2.505000 2.316667 2.511667 2.473333 2.513333
  s 25
2.348333
> s.vars
  s 1      s 2      s 3      s 4      s 5      s 6
0.04294667 0.03412000 0.03693667 0.07287000 0.05078667 0.02405667
  s 7      s 8      s 9      s 10     s 11     s 12
0.00969667 0.07698667 0.07127000 0.14030667 0.05198667 0.01066667
  s 13     s 14     s 15     s 16     s 17     s 18
0.03352000 0.06108000 0.04104000 0.08117667 0.07083000 0.06942667
  s 19     s 20     s 21     s 22     s 23     s 24
0.02341667 0.04179000 0.02990667 0.05201667 0.09142667 0.03054667
  s 25
0.03321667
>
```

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.



The screenshot displays the R Studio environment. The top pane shows a script file named 'IT24103021.R' with the following R code:

```
44 # Question 3:
45 # Mean of the 25 sample means
46 samplesmean <- mean(s.means)
47
48 # Variance of the 25 sample means
49 samplevars <- var(s.means)
50
51 # Display population mean and mean of sample means
52 popmn
53 samplesmean
54
55 # Where n = 6 (sample size)
56 truevar <- popvar / 6
57
58 samplevars
59 truevar
```

The bottom pane shows the console output for the executed code:

```
> # Question 3:
> # Mean of the 25 sample means
> samplesmean <- mean(s.means)
> # Variance of the 25 sample means
> samplevars <- var(s.means)
> # Display population mean and mean of sample means
> popmn
[1] 2.468
> samplesmean
[1] 2.4796
> # Where n = 6 (sample size)
> truevar <- popvar / 6
> samplevars
[1] 0.01536604
> truevar
[1] 0.01093179
```