

Sri Lanka Institute of Information
Technology



Lab Submission

Lab sheet No 08

IT24102384

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Probabilities and Statistics | IT2120

B.Sc. (Hons) in Information Technology

Exercise

```
IT24102384.R*
1 setwd("C:\\Users\\User\\Desktop\\IT24102384")
2
3 data <- read.table("Data - Lab 8.txt", header = TRUE)
4 fix(data)
5 attach(data)
6
7 popmn <- mean(Nicotine)
8 popvar <- var(Nicotine)
9 samples <- c()
10
11 for(i in 1:30){
12   s<-sample(Nicotine,5,replace=TRUE)
13   samples<-cbind(samples, s)
14   n<-c(n,paste('S', i))
15 }
16
17 colnames(samples)=n
18 s.means<-apply(samples,2,mean)
19 s.vars<-apply(samples,2,var)
20
21 samplemean<-mean(s.means)
22 samplevars<-var(s.means)
23
24 #difference between popmean, samplemean:
25 #Population mean (pop_mean): one fixed number, calculated from the entire dataset.
26 #Sample mean (sample_mean): many possible values, depends on which sample we take.
27
28 popmn
29 samplemean
30
31 truevar=popvar/5
32 samplevars
33
```

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
IT24102384.R
34
35 #Exercise
36
37 setwd("C:\\Users\\User\\Desktop\\IT24102384")
38
39
40 data <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
41 fix(data)
42 attach(data)
43
44 weights <- data$weight.kg.
45
46 head(weights)
47
48 #Q1
49 pop_mean <- mean(weights)
50 pop_sd <- sd(weights)
51
52 cat("Population mean =", pop_mean)
53 cat("Population standard deviation =", pop_sd)
54
```

```

55 #Q2
56 set.seed(123)
57 num_samples <- 25
58 sample_size <- 6
59
60 samples <- matrix(nrow = sample_size, ncol = num_samples)
61
62 for (i in 1:num_samples) {
63   samples[, i] <- sample(weights, size = sample_size, replace = TRUE)
64 }
65
66 colnames(samples) <- paste("Sample", 1:num_samples, sep = "_")
67
68 sample_means <- apply(samples, 2, mean)
69 sample_sds <- apply(samples, 2, sd)
70
71 head(sample_means)
72 head(sample_sds)
73
74 #Q3
75 mean_of_sample_means <- mean(sample_means)
76 sd_of_sample_means <- sd(sample_means)
77
78 cat("Mean of sample means =", mean_of_sample_means)
79 cat("Standard deviation of sample means =", sd_of_sample_means)
80

```

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

```

> setwd("C:\\Users\\User\\Desktop\\IT24102384")
> data <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
> fix(data)
> attach(data)

```

The following object is masked from data (pos = 3):

weight.kg.

The following object is masked from data (pos = 4):

weight.kg.

The following object is masked from data (pos = 5):

weight.kg.

The following object is masked from data (pos = 8):

weight.kg.

The following object is masked from data (pos = 9):

weight.kg.

```

> weights <- data$weight.kg.
> head(weights)
[1] 2.46 2.45 2.47 2.71 2.46 2.05
> #Q1
> pop_mean <- mean(weights)
> pop_sd <- sd(weights)
> cat("Population mean =", pop_mean)
Population mean = 2.468
> cat("Population standard deviation =", pop_sd)
Population standard deviation = 0.2561069

```

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

```

> #Q2
> set.seed(123)
> num_samples <- 25
> sample_size <- 6
> samples <- matrix(nrow = sample_size, ncol = num_samples)
> for (i in 1:num_samples) {
+   samples[, i] <- sample(weights, size = sample_size, replace = TRUE)
+ }
> colnames(samples) <- paste("Sample", 1:num_samples, sep = "_")
> sample_means <- apply(samples, 2, mean)
> sample_sds <- apply(samples, 2, sd)
> head(sample_means)
Sample_1 Sample_2 Sample_3 Sample_4 Sample_5 Sample_6
2.530000 2.573333 2.473333 2.591667 2.456667 2.401667
> head(sample_sds)
Sample_1 Sample_2 Sample_3 Sample_4 Sample_5 Sample_6
0.1513935 0.1191078 0.1718914 0.1345239 0.2749303 0.2544340

```

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

```

> #Q3
> mean_of_sample_means <- mean(sample_means)
> sd_of_sample_means <- sd(sample_means)
> cat("Mean of sample means =", mean_of_sample_means)
Mean of sample means = 2.4668
> cat("Standard deviation of sample means =", sd_of_sample_means)
Standard deviation of sample means = 0.07624874

```