Sri Lanka Institute of Information Technology

Lab Submission

Lab sheet: 08

IT24102365

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Probability and Statistics | IT2120

B.Sc. (Hons) in Information Technology

EXERCISE

```
1  getwd()
2  setwd("C:\\Users\\Menura Lakvindu\\Desktop\\IT24102365")
3  getwd()
```

6:10 (Top Level)

Console | Terminal | Jobs

R 4.5.1 · C:/Users/Menura Lakvindu/Desktop/IT24102365/

```
> getwd()
[1] "C:/Users/Menura Lakvindu/Documents"
> setwd("C:\\Users\\Menura Lakvindu\\Desktop\\IT24102365")
> getwd()
[1] "C:/Users/Menura Lakvindu/Desktop/IT24102365"
```

```
> data<-read.table("Exercise - LaptopsWeights.txt",header = TRUE)
> fix(data)
> attach(data)
```

Data Editor

File Edit Help

	Weight.kg.	var2	var3	var4	var5	var6
1	2.46					
2	2.45					
3	2.47					
4	2.71					
5	2.46					
6	2.05					
7	2.6					
8	2.42					
9	2.43					
10	2.53					
11	2.57					

Q1. Calculate the population mean and population standard deviation of the laptop bag weights.

```
> #1.
> pop_mean <- mean(weight.kg.)
> pop_sd <- sqrt(mean((weight.kg. - pop_mean)^2))
> cat("Population mean: ", pop_mean, "\n")
Population mean:  2.468
> cat("Population standard deviation: ", pop_sd, "\n")
Population standard deviation:  0.2528853
```

Q2. Draw 25 random samples of size 6 (with replacement) and calculate the sample mean and sample standard deviation for each sample.

```
> #2.
> samples <- c()
> n <- c()
> for(i in 1:25) {
+   s <- sample(Weight.kg., 6, replace=TRUE)
+   samples <- cbind(samples, s)
+   n <- c(n, paste('s', i))
+ }
> colnames(samples) <- n
> samples
     s 1  s 2  s 3  s 4  s 5  s 6  s 7  s 8  s 9 s 10 s 11 s 12 s 13 s 14 s 15 s 16 s 17 s 18 s 19 s 20 s 21
[1,] 2.66 2.75 2.73 2.43 2.61 2.67 2.23 2.70 2.57 2.05 2.53 2.45 2.05 2.45 2.43 2.13 1.71 2.20 2.66 2.76 2.70
[2,] 2.70 2.42 2.47 2.20 2.70 2.53 2.23 2.13 2.73 2.66 2.85 2.13 2.42 2.53 2.76 2.76 2.42 2.89 2.41 2.53 2.20
[3,] 2.13 2.70 2.57 2.47 2.76 2.20 2.42 2.75 2.17 2.65 2.46 2.65 2.17 2.05 2.75 2.13 2.75 2.20 2.85 2.70 2.70
[4,] 2.57 2.46 2.75 2.57 2.46 2.67 2.53 2.32 2.53 2.89 2.70 2.76 2.70 2.20 2.46 2.61 2.23 2.23 2.67 2.70 2.76
[5,] 2.42 2.42 2.47 2.89 2.70 2.42 1.71 2.20 2.41 2.13 2.57 2.43 2.57 2.20 2.70 2.73 2.60 1.71 2.70 2.51 2.32
[6,] 2.17 2.42 2.05 2.57 2.05 2.05 2.23 2.47 2.17 2.05 2.73 2.47 2.70 2.20 2.61 2.43 2.66 2.28 2.05 2.53 2.60
     s 22 s 23 s 24 s 25
[1,] 2.43 2.47 2.61 2.42
[2,] 2.45 2.05 2.05 2.42
[3,] 2.57 2.76 2.66 2.70
[4,] 2.57 2.57 2.20 2.17
[5,] 1.71 2.73 2.32 2.13
[6,] 2.75 2.70 2.47 2.75
> s.means <- apply(samples, 2, mean)
> s.sds <- apply(samples, 2, sd)
> cat("25 sample means: ", s.means)
25 sample means:  2.441667 2.528333 2.506667 2.521667 2.546667 2.423333 2.225 2.428333 2.43 2.405 2.64 2.481667 2.43
5 2.271667 2.618333 2.465 2.395 2.251667 2.556667 2.621667 2.546667 2.413333 2.546667 2.385 2.431667
> cat("25 sample means standard deviation: ", s.sds)
25 sample means standard deviation:  0.2458794 0.1539372 0.2546894 0.2257801 0.2648522 0.2539029 0.2815493 0.2576367
 0.2259203 0.3709313 0.1450517 0.2160015 0.274718 0.1806008 0.1446951 0.2842358 0.3834971 0.3761604 0.2857738 0.1101
665 0.2310555 0.3629692 0.2667333 0.2383904 0.258102
```

Q3. Calculate the mean and standard deviation of the 25 sample means and state the relationship of them with true mean and true standard deviation.

```
> #3.
> mean_sample_means <- mean(s.means)
> sd_sample_means <- sd(s.means)
> cat("Mean of the 25 sample means: ", mean_sample_means)
Mean of the 25 sample means:  2.460667
> cat("Standard deviation of the 25 sample means: ", sd_sample_means)
Standard deviation of the 25 sample means:  0.1081623
> theoretical_sd <- pop_sd / sqrt(6)
> cat("THEORETICAL VERIFICATION:\n")
THEORETICAL VERIFICATION:
> cat("Population mean (μ): ", pop_mean, "\n")
Population mean (μ):  2.468
> cat("Mean of sample means: ", mean_sample_means, "\n")
Mean of sample means:  2.460667
> cat("Difference: ", mean_sample_means - pop_mean, "\n\n")
Difference:  -0.007333333

> cat("SD of sample population: ", theoretical_sd, "\n")
SD of sample population:  0.10324
> cat("SD of sample means: ", sd_sample_means, "\n")
SD of sample means:  0.1081623
> cat("Difference: ", sd_sample_means - theoretical_sd, "\n")
Difference:  0.004922246
```