

## IT2120 - Probability and Statistics

### Lab Sheet 08

It24100131

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1)

```
setwd("C:\\Users\\it24100131\\Desktop\\it24100131") # Modify path as needed
# Q1
# Laptop bag weights
weight <- c(2.46, 2.45, 2.47, 2.71, 2.46, 2.05, 2.6, 2.42, 2.43, 2.53,
            2.57, 2.85, 2.7, 2.53, 2.28, 2.2, 2.57, 2.89, 2.51, 2.47,
            2.66, 2.06, 2.41, 2.65, 2.76, 2.43, 2.61, 2.57, 2.73, 2.17,
            2.67, 2.05, 1.71, 2.32, 2.23, 2.76, 2.7, 2.13, 2.75, 2.2)

# Population mean and standard deviation
pop_mean <- mean(weight)
pop_sd <- sd(weight)

pop_mean
pop_sd
```

```
> setwd("C:\\Users\\it24100131\\Desktop\\it24100131") # Modify path as needed
> # Laptop bag weights
> weight <- c(2.46, 2.45, 2.47, 2.71, 2.46, 2.05, 2.6, 2.42, 2.43, 2.53,
+           2.57, 2.85, 2.7, 2.53, 2.28, 2.2, 2.57, 2.89, 2.51, 2.47,
+           2.66, 2.06, 2.41, 2.65, 2.76, 2.43, 2.61, 2.57, 2.73, 2.17,
+           2.67, 2.05, 1.71, 2.32, 2.23, 2.76, 2.7, 2.13, 2.75, 2.2)
> # Population mean and standard deviation
> pop_mean <- mean(weight)
> pop_sd <- sd(weight)
>
> pop_mean
[1] 2.468
> pop_sd
[1] 0.2561069
> set.seed(123) # For reproducibility
```

2)

```

#Q2
set.seed(123) # For reproducibility

# Create a matrix with 6 rows (sample size), 25 columns (samples)
samples <- matrix(nrow = 6, ncol = 25)

# Fill matrix with random samples
for (i in 1:25) {
  samples[, i] <- sample(weight, 6, replace = TRUE)
}

# Sample means and standard deviations
sample_means <- apply(samples, 2, mean)
sample_sds <- apply(samples, 2, sd)

# Create a table of results
sample_stats <- data.frame(
  Sample = 1:25,
  Mean = round(sample_means, 4),
  SD = round(sample_sds, 4)
)

print(sample_stats)

.
> # Create a matrix with 6 rows (sample size), 25 columns (samples)
> samples <- matrix(nrow = 6, ncol = 25)
>
> # Fill matrix with random samples
> for (i in 1:25) {
+   samples[, i] <- sample(weight, 6, replace = TRUE)
+ }
> # Sample means and standard deviations
> sample_means <- apply(samples, 2, mean)
> sample_sds <- apply(samples, 2, sd)
> # Create a table of results
> sample_stats <- data.frame(
+   Sample = 1:25,
+   Mean = round(sample_means, 4),
+   SD = round(sample_sds, 4)
+ )

```

```
> print(sample_stats)
  Sample   Mean    SD
1      1 2.5300 0.1514
2      2 2.5733 0.1191
3      3 2.4733 0.1719
4      4 2.5917 0.1345
5      5 2.4567 0.2749
6      6 2.4017 0.2544
7      7 2.5900 0.2167
8      8 2.4667 0.4530
9      9 2.4017 0.2230
10     10 2.3350 0.3238
11     11 2.5867 0.1706
12     12 2.3783 0.3236
13     13 2.3817 0.2994
14     14 2.4650 0.2315
15     15 2.4850 0.1746
16     16 2.4517 0.2763
17     17 2.3850 0.2042
18     18 2.3383 0.2437
19     19 2.4283 0.2481
20     20 2.5517 0.2654
```

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3)

```
#Q3

# From previous steps
sample_mean_of_means <- mean(sample_means)
sample_sd_of_means <- sd(sample_means)

# Population SD from Q1 was:
# pop_sd = 0.2169 (already calculated)

# Sample size
n <- 6

# Theoretical SD of sample means
theoretical_sd_of_means <- pop_sd / sqrt(n)

# Print all
sample_mean_of_means
sample_sd_of_means
theoretical_sd_of_means
```

```

> # From previous steps
> sample_mean_of_means <- mean(sample_means)
> sample_sd_of_means <- sd(sample_means)
>
> # Population SD from Q1 was:
> # pop_sd = 0.2169 (already calculated)
>
> # sample size
> n <- 6
>
> # Theoretical SD of sample means
> theoretical_sd_of_means <- pop_sd / sqrt(n)
>
> # Print all
> sample_mean_of_means
[1] 2.4668
> sample_sd_of_means
[1] 0.07624874
> theoretical_sd_of_means
[1] 0.1045552

```

Environment	History	Connections	Tutorial
<div>  Import Dataset         <div>139 MiB</div> </div> <div> <div>R</div> <div>Global Environment</div> <div> <input type="text"/> </div> </div>			
Data			
sample_stats		25 obs. of 3 variables	
samples		num [1:6, 1:25] 2.67 2.28 2.53 2.47 2.7 2.53...	
Values			
i		25L	
n		6	
pop_mean		2.468	
pop_sd		0.256106948813907	
sample_mean_of_m...		2.4668	
sample_means		num [1:25] 2.53 2.57 2.47 2.59 2.46 ...	
sample_sd_of_mea...		0.0762487401231677	
sample_sds		num [1:25] 0.151 0.119 0.172 0.135 0.275 ...	
theoretical_sd_o...		0.104555224029194	
weight		num [1:40] 2.46 2.45 2.47 2.71 2.46 2.05 2.6 2...	
Files	Plots	Packages	Help
Viewer	Presentation		