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)

```r
#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
```

3)

```r
#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
```