Probability and Statistics

Labsheet 08

```r
 2  weights <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
 3  fix(weights)
 4  attach(weights)
 5  # Extract the Weight column
 6  w <- weights$Weight.kg.
 7
 8 ▾ # -------------------------------
 9  # Question 1:
10  # Population Mean & Population SD
11 ▾ # -------------------------------
12  pop_mean <- mean(w)
13  pop_sd   <- sd(w)
14
15  print("Q1: Population Mean and SD")
16  print(pop_mean)
17  print(pop_sd)
```

```r
20  # Question 2:
21  # 25 random samples of size 6 (with replacement)
22  # and their sample mean & sample SD
23 ▾ # -------------------------------
24  set.seed(42)   # for reproducibility
25
26  sample_means <- c()
27  sample_sds   <- c()
28
29 ▾ for(i in 1:25){
30    samp <- sample(w, size = 6, replace = TRUE)
31    sample_means[i] <- mean(samp)
32    sample_sds[i]   <- sd(samp)
33 ▴ }
34
35  print("Q2: Sample Means (25 samples)")
36  print(sample_means)
37
38  print("Q2: Sample SDs (25 samples)")
39  print(sample_sds)
40
```

```r
41 * # -------------------------------
42   # Question 3:
43   # Mean & SD of the 25 sample means
44   # and compare with true mean & SD
45 * # -------------------------------
46   mean_of_sample_means <- mean(sample_means)
47   sd_of_sample_means   <- sd(sample_means)
48
49   print("Q3: Mean of Sample Means")
50   print(mean_of_sample_means)
51
52   print("Q3: SD of Sample Means")
53   print(sd_of_sample_means)
54
55 * # -------------------------------
56   # Relationships
57 * # -------------------------------
58   print("Relationship:")
59   print(" - Mean of sample means ≈ Population mean")
60   print(" - SD of sample means < Population SD")
61
```

```r
> weights <- read.table("Exercise - LaptopsWeights.txt", header = TRUE)
> fix(weights)
> (weights)
   Weight.kg.
1        2.46
2        2.45
3        2.47
4        2.71
5        2.46
6        2.05
7        2.60
8        2.42
9        2.43
10       2.53
11       2.57
12       2.85
13       2.70
```

```
40          2.20
> # Extract the Weight column
> w <- weights$Weight.kg.
> # ------------------------------
> # Question 1:
> # Population Mean & Population SD
> # ------------------------------
> pop_mean <- mean(w)
> pop_sd   <- sd(w)
> print(pop_mean)
[1] 2.468
> print(pop_sd)
[1] 0.2561069
> # ------------------------------
> # Question 2:
> # 25 random samples of size 6 (with replacement)
> # and their sample mean & sample SD
> # ------------------------------
> set seed(42)    # for reproducibility
```

```
> sample_means <- c()
> sample_sds   <- c()
> for(i in 1:25){
+    samp <- sample(w, size = 6, replace = TRUE)
+    sample_means[i] <- mean(samp)
+    sample_sds[i]   <- sd(samp)
+ }
> print("Q2: Sample Means (25 samples)")
[1] "Q2: Sample Means (25 samples)"
> print(sample_means)
 [1] 2.683333 2.656667 2.621667
 [4] 2.448333 2.223333 2.568333
 [7] 2.463333 2.351667 2.246667
[10] 2.665000 2.476667 2.651667
[13] 2.506667 2.585000 2.501667
[16] 2.501667 2.376667 2.350000
[19] 2.220000 2.320000 2.541667
[22] 2.491667 2.521667 2.475000
```

```
> mean_of_sample_means <- mean(sample_means)
> sd_of_sample_means    <- sd(sample_means)
> print("Q3: Mean of Sample Means")
[1] "Q3: Mean of Sample Means"
> print(mean_of_sample_means)
[1] 2.469867
> print("Q3: SD of Sample Means")
[1] "Q3: SD of Sample Means"
> print(sd_of_sample_means)
[1] 0.1402073
> # -----------------------------
> # Relationships
> # -----------------------------
> print("Relationship:")
[1] "Relationship:"
> print(" - Mean of sample means ≈ Population mean")
[1] " - Mean of sample means ≈ Population mean"
> print(" - SD of sample means < Population SD")
[1] " - SD of sample means < Population SD"
```