

Probability and Statistics-IT24104101

Labsheet 08

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```
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)
18
19
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
```

```

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  $\approx$  Population mean")
60 print(" - SD of sample means < Population SD")
61

```

```

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

```

```

> # 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  $\approx$  Population mean")
[1] " - Mean of sample means  $\approx$  Population mean"
> print(" - SD of sample means < Population SD")
[1] " - SD of sample means < Population SD"

```