IT2120 - Probability and Statistics

Lab Sheet 08

IT24102477

```
> #EXERCISE
> #1
> weights <- c(2.7, 2.4, 2.6, 3.1, 2.3, 2.8, 2.1, 2.5, 2.9, 2.2)
>
> pop_mean <- mean(weights)
>
> pop_sd <- sd(weights) * sqrt((length(weights)-1)/length(weights))
>
> cat("Population mean =", pop_mean, "\n")
Population mean = 2.56
> cat("Population SD   =", pop_sd, "\n")
Population SD   = 0.3039737
>
> #2
> set.seed(123)
> n_samples <- 25
> sample_size <- 6
>
> sample_means <- numeric(n_samples)
> sample_sds   <- numeric(n_samples)
>
> for (i in 1:n_samples) {
+   s <- sample(weights, size = sample_size, replace = TRUE)
+   sample_means[i] <- mean(s)
+   sample_sds[i]   <- sd(s)
+ }
>
>
> samples_df <- data.frame(
+   sample_index = 1:n_samples,
+   sample_mean  = round(sample_means, 4),
+   sample_sd    = round(sample_sds, 4)
+ )
>
```

```
> print(samples_df)
   sample_index sample_mean sample_sd
1             1      2.4833    0.2229
2             2      2.6500    0.3507
3             3      2.6667    0.2875
4             4      2.6000    0.3899
5             5      2.4167    0.3817
6             6      2.3000    0.2608
7             7      2.5333    0.2251
8             8      2.6667    0.3266
9             9      2.6833    0.3430
10           10      2.6833    0.2639
11           11      2.7500    0.2739
12           12      2.6500    0.3209
13           13      2.4000    0.3033
14           14      2.3833    0.1472
15           15      2.5667    0.3615
16           16      2.6167    0.1169
17           17      2.2333    0.2805
18           18      2.3667    0.2503
19           19      2.6167    0.3971
20           20      2.6000    0.3578
21           21      2.7333    0.3882
22           22      2.7667    0.2805
23           23      2.8000    0.3347
24           24      2.5000    0.3033
25           25      2.4833    0.3710
>
> #3
> mean_of_sample_means <- mean(sample_means)
>
> sd_of_sample_means <- sd(sample_means)
>
> theoretical_se <- pop_sd / sqrt(sample_size)
>
```

```
>
> cat("Mean of sample means =", mean_of_sample_means, "\n")
Mean of sample means = 2.566
> cat("SD of sample means   =", sd_of_sample_means, "\n")
SD of sample means   = 0.1513428
> cat("Theoretical SE       =", theoretical_se, "\n")
Theoretical SE       = 0.1240967
>
```