

```

2 data<-read.table("Data - Lab 8.txt",header=TRUE)
3 fix(data)
4 attach(data)
5
6 #Q1
7 popmn<-mean(Nicotine)
8 popvar<-var(Nicotine)
9
10 #Q2
11 samples<-c()
12 n<-c()
13
14 for (i in 1:30){
15   s<-sample(Nicotine,5,replace=TRUE)
16   samples<-cbind(samples,s)
17   n<-c(n,paste('S',i))
18 }
19 colnames(samples)=n
20
21 for (i in 1:30){
22   s<-sample(Nicotine,5,replace=TRUE)
23   samples<-cbind(samples,s)
24   n<-c(n,paste('S',i))
25 }
26 colnames(samples)=n
27 s.means<-apply(samples,2,mean)
28 s.vars<-apply(samples,2,var)
29
30 #Q3
31 samplemean<-mean(s.means)
32 samplevars<-var(s.means)
33
34 #Q4
35 popmn

```

```

16 samples<-cbind(samples,s)
17 n<-c(n,paste('S',i))
18 }
19 colnames(samples)=n
20 s.means<-apply(samples,2,mean)
21 s.vars<-apply(samples,2,var)
22
23 #Q3
24 samplemean<-mean(s.means)
25 samplevars<-var(s.means)
26
27 #Q4
28 popmn
29 samplemean
30
31 #Q5
32 truevar=popvar/5
33 samplevars
34

```

|    | Nicotine | var2 | var3 | var4 | var5 | var6 | var7 |
|----|----------|------|------|------|------|------|------|
| 1  | 1.09     |      |      |      |      |      |      |
| 2  | 1.74     |      |      |      |      |      |      |
| 3  | 1.58     |      |      |      |      |      |      |
| 4  | 2.11     |      |      |      |      |      |      |
| 5  | 1.64     |      |      |      |      |      |      |
| 6  | 1.79     |      |      |      |      |      |      |
| 7  | 1.37     |      |      |      |      |      |      |
| 8  | 1.75     |      |      |      |      |      |      |
| 9  | 1.92     |      |      |      |      |      |      |
| 10 | 1.47     |      |      |      |      |      |      |
| 11 | 2.03     |      |      |      |      |      |      |
| 12 | 1.86     |      |      |      |      |      |      |
| 13 | 0.72     |      |      |      |      |      |      |
| 14 | 2.46     |      |      |      |      |      |      |
| 15 | 1.93     |      |      |      |      |      |      |
| 16 | 1.63     |      |      |      |      |      |      |
| 17 | 2.31     |      |      |      |      |      |      |
| 18 | 1.97     |      |      |      |      |      |      |
| 19 | 1.7      |      |      |      |      |      |      |

**Q1**

```
popmn<-mean(Nicotine)
popvar<-var(Nicotine)
```

**Q2**

```
> #Q2
> samples<-c()
> n<-c()
> for (i in 1:30){
+   s<-sample(Nicotine,5,replace=TRUE)
+   samples<-cbind(samples,s)
+   n<-c(n,paste('S',i))
+ }
> colnames(samples)=n
> colnames(samples)=n
> s.means<-apply(samples,2,mean)
> s.vars<-apply(samples,2,var)
```

**Q3**

```
> #Q3
> samplemean<-mean(s.means)
> samplevars<-var(s.means)
```

#### Q4

```
> #Q4
> popmn
[1] 1.77425
> samplemean
[1] 1.7716
```

#### Q5

```
> #Q5
> truevar=popvar/5
> samplevars
[1] 0.02835846
```

### Exercise

#### Q1

```
38 data<-read.table("Exercise - Laptopsweights.txt",header=TRUE)
39 fix(data)
40 attach(data)
41
42 weight <- as.numeric(data$weight.kg.)
43 weight <- weight
44 popmn <- mean(weight)
45 popsd <- sd(weight)
46
47 #Q2
48 samples <- c()
49 n <- c()
50
51 set.seed(123)
52 num_samples <- 25
53 sample_size <- 6
54
55 sample_means <- numeric(num_samples)
56 sample_sds <- numeric(num_samples)
57
58 for (i in 1:num_samples) {
59   s <- sample(weight, sample_size, replace = TRUE)
60   sample_means[i] <- mean(s)
61   sample_sds[i] <- sd(s)
62 }
63
64 #Q3
65 mean_of_sample_means <- mean(sample_means)
66 sd_of_sample_means <- sd(sample_means)
67
```

```
> popmn <- mean(weight)
> popsd <- sd(weight)
```

**Q2**

```

> #Q2
> samples <- c()
> n <- c()
> for (i in 1:25) {
+   s <- sample(weight, 6, replace = TRUE)
+   samples <- cbind(samples, s)
+   n <- c(n, paste("S", i))
+ }
> colnames(samples) <- n
> s.means <- apply(samples, 2, mean)
> s.vars <- apply(samples, 2, var)

```

### Q3

```

> #Q3
> mean_of_sample_means <- mean(sample_means)
> sd_of_sample_means <- sd(sample_means)

```

|                      |   |  |
|----------------------|---|--|
| R Global Environment |   |  |
| popmn                | 1.77425   |  |
| popvar               | 0.152455833333333                                     |  |
| s                    | num [1:5] 1.86 2.31 1.93 1.47 1.85                    |  |
| s.means              | Named num [1:30] 1.87 1.9 1.65 1.48 1.72 ...          |  |
| s.vars               | Named num [1:30] 0.04127 0.08557 0.04562 0.36072 0... |  |
| samplemean           | 1.7882  |  |
| samplevars           | 0.0257234068965517                                    |  |
| truevar              | 0.0304911666666667                                    |  |