```
R 4.5.1 · C:/Users/kamsh/OneDrive/Desktop/Lab 08_IT24100697/
> setwd("C:\\Users\\kamsh\\OneDrive\\Desktop\\Lab  08_IT24100697")
> data<-read.table("Data - Lab 8.txt",header=TRUE)
> fix(data)
> attach(data)

The following object is masked from data (pos = 3):

    Nicotine

> popmn<- mean(Nicotine)
> popmn
[1] 1.77425
> popvar<-var(Nicotine)
> popvar
[1] 0.1524558
```

```
> 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
> s
[1] 1.47 0.85 1.69 1.86 1.82
> n
 [1] "S 1"  "S 2"  "S 3"  "S 4"  "S 5"  "S 6"  "S 7"  "S 8"  "S 9"  "S 10" "S 11" "S 12"
[13] "S 13" "S 14" "S 15" "S 16" "S 17" "S 18" "S 19" "S 20" "S 21" "S 22" "S 23" "S 24"
[25] "S 25" "S 26" "S 27" "S 28" "S 29" "S 30"
> samples
     S 1  S 2  S 3  S 4  S 5  S 6  S 7  S 8  S 9 S 10 S 11 S 12 S 13 S 14 S 15 S 16 S 17
[1,] 1.75 2.37 1.93 1.47 1.40 1.82 1.93 1.92 1.67 2.28 2.46 1.79 1.88 1.40 0.72 1.70 2.55
[2,] 1.75 2.08 1.86 2.03 0.72 2.08 1.93 1.75 1.69 0.85 0.85 1.58 1.79 1.67 1.58 1.74 1.68
[3,] 1.63 1.69 2.17 2.31 1.86 1.64 2.31 1.90 1.75 1.67 1.97 2.31 2.08 2.08 1.97 1.79 1.68
[4,] 1.86 1.40 1.85 1.79 1.24 1.79 2.46 1.51 2.46 1.24 1.92 1.58 1.75 1.75 1.09 2.08 1.64
[5,] 1.93 1.92 1.64 2.31 2.11 2.17 2.17 0.85 1.92 2.03 2.17 1.24 1.64 2.08 1.75 1.37 1.40
     S 18 S 19 S 20 S 21 S 22 S 23 S 24 S 25 S 26 S 27 S 28 S 29 S 30
[1,] 2.31 1.47 2.08 2.37 2.17 1.69 2.03 1.74 1.86 0.85 1.70 2.03 1.47
[2,] 1.58 1.93 1.47 1.47 0.72 1.64 1.24 1.63 2.55 1.51 1.24 1.97 0.85
[3,] 1.74 1.37 1.75 1.68 1.37 1.88 1.67 1.70 1.51 1.47 2.31 1.85 1.69
[4,] 2.46 2.08 1.68 2.28 1.93 1.51 1.88 1.97 2.17 1.63 1.37 1.69 1.86
[5,] 1.69 2.28 1.69 1.74 1.97 1.75 2.03 1.68 1.82 1.69 1.82 1.40 1.82
> s.means<-apply(samples,2,mean)
> s.means
  S 1   S 2   S 3   S 4   S 5   S 6   S 7   S 8   S 9  S 10  S 11  S 12  S 13  S 14  S 15
1.784 1.892 1.890 1.982 1.466 1.900 2.160 1.586 1.898 1.614 1.874 1.700 1.828 1.796 1.422
 S 16  S 17  S 18  S 19  S 20  S 21  S 22  S 23  S 24  S 25  S 26  S 27  S 28  S 29  S 30
1.736 1.790 1.956 1.826 1.734 1.908 1.632 1.694 1.770 1.744 1.982 1.430 1.688 1.788 1.538
> s.vars<-apply(samples,2,var)
> s.vars
    S 1     S 2     S 3     S 4     S 5     S 6     S 7     S 8     S 9    S 10    S 11
0.01328 0.13687 0.03625 0.12912 0.29548 0.04785 0.05460 0.19613 0.10837 0.33583 0.37273
   S 12    S 13    S 14    S 15    S 16    S 17    S 18    S 19    S 20    S 21    S 22
```

```
popvar   0.152455833333333
s        num [1:6] 2.2 2.47 1.71 2.2 2.89 2.75
s.means  Named num [1:30] 1.78 1.89 1.89 1.98 1.47 ...
s.vars   Named num [1:30] 0.0133 0.1369 0.0362 0.1291 0.2955 .
sample_means   Named num [1:25] 2.53 2.54 2.37 2.39 2.52 ...
sample_names   chr [1:25] "s 1" "s 2" "s 3" "s 4" "s 5" "s 6" "s 7"
sample_sds     Named num [1:25] 0.195 0.179 0.175 0.22 0.124 ...
samplemean     1.76693333333333
samplevars     0.0295701333333333
sd_of_sample_means   0.0988504763097612
```

```
Files | Plots | Packages | Help | Viewer | Presentation
New Folder | New File | Delete | Rename | More
Home
Name                          Size      Modified
.Rhistory                     0 B       Sep 15, 2025, 9:31 AM
anaconda_projects
Arduino
Custom Office Templates
desktop.ini                   402 B     Mar 14, 2025, 2:11 PM
Downloads
Drawing1.dwl                  45 B      Jun 2, 2024, 9:48 PM
Drawing1.dwl2                 195 B     Jun 2, 2024, 9:48 PM
Eclipse
excercise.xlsx                12.7 KB   Apr 19, 2024, 12:41 PM
Git Bash.lnk                  1.7 KB    Mar 7, 2025, 11:12 AM
Git-2.48.1-64-bit.exe         66.3 MB   Mar 7, 2025, 11:05 AM
Group activity.docx           12.3 KB   May 2, 2024, 3:10 PM
HEUKMSActivator42.0.1.k.taiwebs.com
Inventor Server for AutoCAD
```

```
Console | Terminal | Background Jobs
R 4.5.1 · C:/Users/kamsh/OneDrive/Desktop/Lab 08_IT24100697/
> s.vars
     S 1      S 2      S 3      S 4      S 5      S 6      S 7      S 8      S 9     S 10     S 11
0.01328  0.13687  0.03625  0.12912  0.29548  0.04785  0.05460  0.19613  0.10837  0.33583  0.37273
    S 12     S 13     S 14     S 15     S 16     S 17     S 18     S 19     S 20     S 21     S 22
0.15515  0.02727  0.08403  0.25897  0.06413  0.19410  0.15953  0.15403  0.04863  0.15597  0.34822
    S 23     S 24     S 25     S 26     S 27     S 28     S 29     S 30
0.01863  0.10955  0.01753  0.15547  0.11300  0.17657  0.06392  0.17107
> samplemean<-mean(s.means)
> samplemean
[1] 1.766933
> samplevars<-var(s.means)
> samplevars
[1] 0.02957013
> popmn
[1] 1.77425
> samplemean
[1] 1.766933
> truevar=popvar/5
> samplevars
[1] 0.02957013
> #Exercise
> data<- read.table("Exercise - LaptopsWeights.txt" , header = TRUE)
> fix(data)
> attach(data)
> pop_mean <- mean(Weight.kg.)
> pop_mean
[1] 2.468
> pop_sd <- sd(Weight.kg.)
> pop_sd
[1] 0.2561069
> samples <- c()
> sample_names <- c()
> for(i in 1:25) {
+   s <- sample(Weight.kg., 6, replace=TRUE)
+   samples <- cbind(samples, s)
+   sample_names <- c(sample_names, paste("s", i))
+ }
```

```
Console   Terminal   Background Jobs
R 4.5.1 · C:/Users/kamsh/OneDrive/Desktop/Lab 08_IT24100697/
> colnames(samples) <- sample_names
> s
[1] 2.20 2.47 1.71 2.20 2.89 2.75
> samples
      s 1  s 2  s 3  s 4  s 5  s 6  s 7  s 8  s 9 s 10 s 11 s 12 s 13 s 14 s 15 s 16 s 17
[1,] 2.76 2.53 2.57 2.06 2.76 2.76 2.43 2.57 2.46 2.76 2.57 2.20 2.53 2.28 2.53 2.53 2.76
[2,] 2.57 2.53 2.47 2.45 2.45 2.28 2.75 2.67 2.65 2.46 2.17 2.43 2.46 2.65 2.57 2.67 2.70
[3,] 2.71 2.20 2.17 2.66 2.41 2.46 2.65 2.05 2.06 2.85 2.57 2.47 2.65 2.45 2.66 2.76 2.71
[4,] 2.45 2.70 2.20 2.47 2.47 2.17 2.13 2.70 2.45 2.51 2.67 2.76 2.70 2.66 2.23 2.70 2.43
[5,] 2.45 2.60 2.28 2.51 2.51 2.65 2.20 2.47 2.20 2.70 2.06 2.57 2.76 2.46 2.47 2.42 2.43
[6,] 2.23 2.66 2.53 2.20 2.51 2.46 2.32 2.67 2.43 2.70 2.66 2.13 2.46 2.23 2.32 2.61 2.60
     s 18 s 19 s 20 s 21 s 22 s 23 s 24 s 25
[1,] 2.71 2.66 2.17 2.67 2.06 2.23 2.57 2.20
[2,] 2.76 2.47 2.73 2.28 2.17 2.65 2.51 2.47
[3,] 2.53 2.76 2.43 2.20 1.71 2.89 2.13 1.71
[4,] 2.45 2.05 2.76 2.47 2.57 2.75 2.73 2.20
[5,] 2.46 2.85 2.43 2.61 2.66 2.53 2.45 2.89
[6,] 2.46 2.13 2.42 2.05 2.20 2.51 2.43 2.75
> sample_names
 [1] "s 1"  "s 2"  "s 3"  "s 4"  "s 5"  "s 6"  "s 7"  "s 8"  "s 9"  "s 10" "s 11" "s 12"
[13] "s 13" "s 14" "s 15" "s 16" "s 17" "s 18" "s 19" "s 20" "s 21" "s 22" "s 23" "s 24"
[25] "s 25"
> sample_means <- apply(samples, 2, mean)
> sample_means
     s 1      s 2      s 3      s 4      s 5      s 6      s 7      s 8      s 9     s 10
2.528333 2.536667 2.370000 2.391667 2.518333 2.463333 2.413333 2.521667 2.375000 2.663333
    s 11     s 12     s 13     s 14     s 15     s 16     s 17     s 18     s 19     s 20
2.450000 2.426667 2.593333 2.455000 2.463333 2.615000 2.605000 2.561667 2.486667 2.490000
    s 21     s 22     s 23     s 24     s 25
2.380000 2.228333 2.593333 2.470000 2.370000
> sample_sds <- apply(samples, 2, sd)
> sample_sds
      s 1       s 2       s 3       s 4       s 5       s 6       s 7       s 8       s 9
0.1947734 0.1785124 0.1746997 0.2201288 0.1243248 0.2202423 0.2466306 0.2462857 0.2104044
     s 10      s 11      s 12      s 13      s 14      s 15      s 16      s 17      s 18
0.1494880 0.2652546 0.2336379 0.1280104 0.1796385 0.1609555 0.1237336 0.1451551 0.1381907
     s 19      s 20      s 21      s 22      s 23      s 24      s 25
0.3331466 0.2213594 0.2434748 0.3476445 0.2274789 0.1983935 0.4285324
```

```
2.380000 2.228333 2.593333 2.470000 2.370000
> sample_sds <- apply(samples, 2, sd)
> sample_sds
      s 1       s 2       s 3       s 4       s 5       s 6       s 7       s 8       s 9
0.1947734 0.1785124 0.1746997 0.2201288 0.1243248 0.2202423 0.2466306 0.2462857 0.2104044
     s 10      s 11      s 12      s 13      s 14      s 15      s 16      s 17      s 18
0.1494880 0.2652546 0.2336379 0.1280104 0.1796385 0.1609555 0.1237336 0.1451551 0.1381907
     s 19      s 20      s 21      s 22      s 23      s 24      s 25
0.3331466 0.2213594 0.2434748 0.3476445 0.2274789 0.1983935 0.4285324
>
> mean_of_sample_means <- mean(sample_means)
> sd_of_sample_means <- sd(sample_means)
>
>
> pop_mean
[1] 2.468
> pop_sd
[1] 0.2561069
> mean_of_sample_means
[1] 2.4788
> sd_of_sample_means
[1] 0.09885048
>
```