

Εργαστηριακή Άσκηση 1

Θέμα: Εισαγωγή στο R

1.

```
> install.packages("bootstrap")  
> library("bootstrap")
```

2.

```
> R<-3:20  
> volume<-rep(0,18)  
> for(i in 1:18)  
+ volume[i]<-4/3*pi*R[i]^3  
> volume  
[1] 113.0973 268.0826 523.5988 904.7787 1436.7550 2144.6606  
[7] 3053.6281 4188.7902 5575.2798 7238.2295 9202.7721 11494.0403  
[13] 14137.1669 17157.2847 20579.5263 24429.0245 28730.9120 33510.3216  
> volume2<-4/3*pi*R^3  
> volume2  
[1] 113.0973 268.0826 523.5988 904.7787 1436.7550 2144.6606  
[7] 3053.6281 4188.7902 5575.2798 7238.2295 9202.7721 11494.0403  
[13] 14137.1669 17157.2847 20579.5263 24429.0245 28730.9120 33510.3216
```

3.

```
> res<-1  
> for(i in 1:200)  
+ res<-res*i  
> res  
[1] Inf  
> prod(1:200)  
[1] Inf
```

4.

```
> x<-c(2, 3, 1, 5, 6, 3, 2, 5, 7, 9, 10, 11, 9, 8)  
> length(x)  
[1] 14  
> min(x)  
[1] 1  
> max(x)  
[1] 11  
> sort(x)  
[1] 1 2 2 3 3 5 5 6 7 8 9 9 10 11
```

```

> rank(x)
[1] 2.5 4.5 1.0 6.5 8.0 4.5 2.5 6.5 9.0 11.5 13.0 14.0 11.5 10.0
> rank(x, ties.method="average")
[1] 2.5 4.5 1.0 6.5 8.0 4.5 2.5 6.5 9.0 11.5 13.0 14.0 11.5 10.0
> rank(x, ties.method="first")
[1] 2 4 1 6 8 5 3 7 9 11 13 14 12 10
> rank(x, ties.method="random")
[1] 2 4 1 6 8 5 3 7 9 11 13 14 12 10
> rank(x, ties.method="min")
[1] 2 4 1 6 8 4 2 6 9 11 13 14 11 10
> rank(x, ties.method="max")
[1] 3 5 1 7 8 5 3 7 9 12 13 14 12 10

```

5.

```

> med<-function(x)
+ {
+ y<-sort(x)
+ n<-length(x)
+ if(n%%2==0)
+ z<-(y[n/2]+y[n/2+1])/2
+ else
+ z<-y[(n+1)/2]
+ return(z)
+ }

```

6.

```

> 22^300/21^250
[1] NaN
> exp(300*log(22)-250*log(21))
[1] 1.485869e+72

```

7.

```

> X<-matrix(scan("data1-da.txt"), ncol=6, byrow=T)
Read 186 items
> X
      [,1] [,2] [,3] [,4] [,5] [,6]
[1,] 33741  15 3.731 67.0  1  0
[2,] 37251  17 3.500 62.0  0  0
[3,] 37252  16 3.674 67.5  0  0
[4,] 37441  17 5.633 73.0  1  0
[5,] 44241  16 3.645 73.5  1  0
[6,] 48152  15 2.887 63.0  0  0
[7,] 52841  17 3.960 70.0  1  0
[8,] 52842  16 4.299 66.0  1  0
[9,] 55951  16 2.981 66.0  0  0
[10,] 63241  16 4.504 72.0  1  0
[11,] 71141  17 5.638 70.0  1  0

```

```

[12,] 73751 18 2.853 60.0 0 0
[13,] 77151 15 3.211 66.5 0 0
[14,] 45241 9 1.953 58.0 1 1
[15,] 4952 14 2.236 66.0 0 1
[16,] 10053 14 3.428 64.0 0 1
[17,] 11151 13 3.208 61.0 0 1
[18,] 11601 11 1.694 60.0 1 1
[19,] 11642 14 3.957 72.0 1 1
[20,] 11942 13 4.789 69.0 1 1
[21,] 15302 12 2.384 63.5 0 1
[22,] 15751 14 3.074 65.0 0 1
[23,] 16551 10 2.387 66.0 0 1
[24,] 19601 12 3.835 69.5 0 1
[25,] 23651 13 2.599 62.5 0 1
[26,] 24642 13 4.756 68.0 1 1
[27,] 27951 13 3.086 67.5 0 1
[28,] 30042 14 4.309 69.0 1 1
[29,] 30052 10 3.413 66.0 0 1
[30,] 31502 10 2.975 63.0 0 1
[31,] 34201 11 3.169 62.5 0 1

```

```
> dim(X)
```

```
[1] 31 6
```

```
> Y<-X[,c(2,3)]
```

```
> Y
```

```

      [,1] [,2]
[1,] 15 3.731
[2,] 17 3.500
[3,] 16 3.674
[4,] 17 5.633
[5,] 16 3.645
[6,] 15 2.887
[7,] 17 3.960
[8,] 16 4.299
[9,] 16 2.981
[10,] 16 4.504
[11,] 17 5.638
[12,] 18 2.853
[13,] 15 3.211
[14,] 9 1.953
[15,] 14 2.236
[16,] 14 3.428
[17,] 13 3.208
[18,] 11 1.694
[19,] 14 3.957
[20,] 13 4.789
[21,] 12 2.384
[22,] 14 3.074
[23,] 10 2.387
[24,] 12 3.835
[25,] 13 2.599

```

```

[26,] 13 4.756
[27,] 13 3.086
[28,] 14 4.309
[29,] 10 3.413
[30,] 10 2.975
[31,] 11 3.169
> write(t(Y), "Y.txt", ncol=2)
> apply(X,1,sum)
 [1] 33827.731 37333.500 37339.174 37537.633 44335.145 48232.887 52932.960
 [8] 52929.299 56035.981 63334.504 71234.638 73831.853 77235.711 45311.953
[15] 5035.236 10135.428 11229.208 11675.694 11733.957 12030.789 15380.884
[22] 15834.074 16630.387 19687.335 23730.099 24729.756 28035.586 30131.309
[29] 30132.413 31578.975 34278.669
> Xdata<-as.data.frame(X)
> Xdata
   V1 V2  V3  V4 V5 V6
1 33741 15 3.731 67.0 1 0
2 37251 17 3.500 62.0 0 0
3 37252 16 3.674 67.5 0 0
4 37441 17 5.633 73.0 1 0
5 44241 16 3.645 73.5 1 0
6 48152 15 2.887 63.0 0 0
7 52841 17 3.960 70.0 1 0
8 52842 16 4.299 66.0 1 0
9 55951 16 2.981 66.0 0 0
10 63241 16 4.504 72.0 1 0
11 71141 17 5.638 70.0 1 0
12 73751 18 2.853 60.0 0 0
13 77151 15 3.211 66.5 0 0
14 45241 9 1.953 58.0 1 1
15 4952 14 2.236 66.0 0 1
16 10053 14 3.428 64.0 0 1
17 11151 13 3.208 61.0 0 1
18 11601 11 1.694 60.0 1 1
19 11642 14 3.957 72.0 1 1
20 11942 13 4.789 69.0 1 1
21 15302 12 2.384 63.5 0 1
22 15751 14 3.074 65.0 0 1
23 16551 10 2.387 66.0 0 1
24 19601 12 3.835 69.5 0 1
25 23651 13 2.599 62.5 0 1
26 24642 13 4.756 68.0 1 1
27 27951 13 3.086 67.5 0 1
28 30042 14 4.309 69.0 1 1
29 30052 10 3.413 66.0 0 1
30 31502 10 2.975 63.0 0 1
31 34201 11 3.169 62.5 0 1
> names(Xdata)<-c('ID', 'AGE', 'FEV', 'HEIGHT', 'SEX', 'SMOKING')
> Xdata
  ID AGE  FEV HEIGHT SEX SMOKING

```

```

1 33741 15 3.731 67.0 1 0
2 37251 17 3.500 62.0 0 0
3 37252 16 3.674 67.5 0 0
4 37441 17 5.633 73.0 1 0
5 44241 16 3.645 73.5 1 0
6 48152 15 2.887 63.0 0 0
7 52841 17 3.960 70.0 1 0
8 52842 16 4.299 66.0 1 0
9 55951 16 2.981 66.0 0 0
10 63241 16 4.504 72.0 1 0
11 71141 17 5.638 70.0 1 0
12 73751 18 2.853 60.0 0 0
13 77151 15 3.211 66.5 0 0
14 45241 9 1.953 58.0 1 1
15 4952 14 2.236 66.0 0 1
16 10053 14 3.428 64.0 0 1
17 11151 13 3.208 61.0 0 1
18 11601 11 1.694 60.0 1 1
19 11642 14 3.957 72.0 1 1
20 11942 13 4.789 69.0 1 1
21 15302 12 2.384 63.5 0 1
22 15751 14 3.074 65.0 0 1
23 16551 10 2.387 66.0 0 1
24 19601 12 3.835 69.5 0 1
25 23651 13 2.599 62.5 0 1
26 24642 13 4.756 68.0 1 1
27 27951 13 3.086 67.5 0 1
28 30042 14 4.309 69.0 1 1
29 30052 10 3.413 66.0 0 1
30 31502 10 2.975 63.0 0 1
31 34201 11 3.169 62.5 0 1
> Xdata<-cbind(Xdata,1)

```

8.

```

> matrix_function<-function(X)
+ {
+ n<-nrow(X)
+ p<-ncol(X)
+ if(n!=p)
+ stop("Your Matrix is not Square")
+ if(det(X)==0)
+ stop("The Determinant of your matrix is zero")
+ y<-list(determinant=det(X), inverse=solve(X))
+ return(y)
+ }

> X<-matrix(1:4, ncol=2)
> X

```

```

      [,1] [,2]
[1,]  1  3
[2,]  2  4
> matrix_function(X)
$determinant
[1] -2

```

```

$inverse
      [,1] [,2]
[1,] -2  1.5
[2,]  1 -0.5

```

```

> X<-rbind(X,1)
> X

```

```

      [,1] [,2]
[1,]  1  3
[2,]  2  4
[3,]  1  1
> matrix_function(X)

```

Error in matrix_function(X) : Your Matrix is not Square

```

> X<-matrix(c(1,2,1,2), ncol=2)

```

```

> X

```

```

      [,1] [,2]
[1,]  1  1
[2,]  2  2

```

```

> matrix_function(X)

```

Error in matrix_function(X) : The Determinant of your matrix is zero

Επίσης ελέγξτε την συνάρτησή σας με τους παρακάτω πίνακες:

$$\begin{pmatrix} -1 & 1 & 2 \\ 3 & 5 & 9 \\ 1 & 7 & 13 \end{pmatrix} \quad \begin{pmatrix} -1 & 2 & 1 \\ 3 & 5 & 2 \\ -1 & 1 & 3 \end{pmatrix} \quad \begin{pmatrix} -1 & 2 & 1 & 3 \\ 3 & 5 & 2 & 3 \\ -1 & 1 & 3 & 2 \end{pmatrix}$$