Lab1.R

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```
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## Chapter 1

dieroll <- c(2,5,1,6,5,5,4,1)
dieroll
```

```
## [1] 2 5 1 6 5 5 4 1
```

```
ls()
```

```
## [1] "dieroll"
```

```
newdieroll <- dieroll/2
newdieroll
```

```
## [1] 1.0 2.5 0.5 3.0 2.5 2.5 2.0 0.5
```

```
ls()
```

```
## [1] "dieroll"    "newdieroll"
```

```
rm(newdieroll)
ls()
```

```
## [1] "dieroll"
```

```
help(log)

log(100) # natural log
```

```
## [1] 4.60517
```

```
log2(16)
```

```
## [1] 4
```

```
log(1000,base=10)
```

```
## [1] 3
```

```
log2(c(1,2,3,4))
```

```
## [1] 0.000000 1.000000 1.584963 2.000000
```

```
apropos("norm")
```

```
##  [1] "dlnorm"        "dnorm"         "norm"          "normalizePath"
##  [5] "plnorm"        "pnorm"         "qlnorm"        "qnorm"
```

```
##  [9] "qqnorm"        "rlnorm"        "rnorm"
```

```
a <- c(1,2,3,4,5,6,7,8)
A <- matrix(a,nrow=2,ncol=4, byrow=FALSE)
A
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    3    5    7
## [2,]    2    4    6    8
```

```
# Exercises

#1
help(mean)
help(median)
#2
apropos("test")
```

```
##  [1] ".valueClassTest"      "ansari.test"          "bartlett.test"
##  [4] "binom.test"           "Box.test"             "chisq.test"
##  [7] "cor.test"             "file_test"            "fisher.test"
## [10] "fligner.test"         "friedman.test"        "kruskal.test"
## [13] "ks.test"              "mantelhaen.test"      "mauchly.test"
## [16] "mcnemar.test"         "mood.test"            "oneway.test"
## [19] "pairwise.prop.test"   "pairwise.t.test"      "pairwise.wilcox.test"
## [22] "poisson.test"         "power.anova.test"     "power.prop.test"
## [25] "power.t.test"         "PP.test"              "prop.test"
## [28] "prop.trend.test"      "quade.test"           "shapiro.test"
## [31] "t.test"               "testInheritedMethods" "testVirtual"
## [34] "var.test"             "wilcox.test"
```

```
#3
info <- c(21,181,8216341022)
info
```

```
## [1]         21        181 8216341022
```

```
#4
Ident <- matrix(c(1,0,0,0,1,0,0,0,1),nrow=3)
Ident
```

```
##      [,1] [,2] [,3]
## [1,]    1    0    0
## [2,]    0    1    0
## [3,]    0    0    1
```

```
#5
#Saved

## Chapter 2

# Basic math
2+3
```

```
## [1] 5
```

```
3/2
```

```
## [1] 1.5
```

```r
2^3 # this also can be written as 2**3
```

```
## [1] 8
```

```r
4^2-3*2
```

```
## [1] 10
```

```r
(56-14)/6 - 4*7*10/(5^2-5) # this is more complicated
```

```
## [1] -7
```

```r
sqrt(2)
```

```
## [1] 1.414214
```

```r
abs(2-4)
```

```
## [1] 2
```

```r
cos(4*pi)
```

```
## [1] 1
```

```r
log(0)
```

```
## [1] -Inf
```

```r
factorial(6)
```

```
## [1] 720
```

```r
choose(52,5) # 52C5
```

```
## [1] 2598960
```

```r
# Vector Arithmetic
x <- c(1,2,3,4)
y <- c(5,6,7,8)
x*y
```

```
## [1]  5 12 21 32
```

```r
y/x
```

```
## [1] 5.000000 3.000000 2.333333 2.000000
```

```r
y-x
```

```
## [1] 4 4 4 4
```

```r
x^y
```

```
## [1]     1    64  2187 65536
```

```r
cos(x*pi) + cos(y*pi)
```

```
## [1] -2  2 -2  2
```

```r
s <- c(1,1,3,4,7,11)
length(s)
```

```
## [1] 6
```

```r
sum(s) # 1+1+3+4+7+11
```

```
## [1] 27
```

```r
prod(s) # 1*1*3*4*7*11
```

```
## [1] 924
```

```r
cumsum(s)
```

```
## [1]  1  2  5  9 16 27
```

```r
sort(s)
```

```
## [1]  1  1  3  4  7 11
```

```r
diff(s) # 1-1, 3-1, 4-3, 7-4, 11-7
```

```
## [1] 0 2 1 3 4
```

```r
diff(s, lag = 2) # 3-1, 4-1, 7-3, 11-4
```

```
## [1] 2 3 4 7
```

```r
# Matrix Operations
a <- c(1,2,3,4,5,6,7,8,9,10)
A <- matrix(a, nrow = 5, ncol = 2) # fill in by column
A
```

```
##      [,1] [,2]
## [1,]    1    6
## [2,]    2    7
## [3,]    3    8
## [4,]    4    9
## [5,]    5   10
```

```r
B <- matrix(a, nrow = 5, ncol = 2, byrow = TRUE) # fill in by row
B
```

```
##      [,1] [,2]
## [1,]    1    2
## [2,]    3    4
## [3,]    5    6
## [4,]    7    8
## [5,]    9   10
```

```r
C <- matrix(a, nrow = 2, ncol = 5, byrow = TRUE)
C
```

```
##      [,1] [,2] [,3] [,4] [,5]
## [1,]    1    2    3    4    5
## [2,]    6    7    8    9   10
```

```r
dim(C)
```

```
## [1] 2 5
```

```r
t(C) # this is the same as A
```

```
##      [,1] [,2]
## [1,]    1    6
## [2,]    2    7
```

```
## [3,]    3    8
## [4,]    4    9
## [5,]    5   10
```

```
B%*%C
```

```
##      [,1] [,2] [,3] [,4] [,5]
## [1,]   13   16   19   22   25
## [2,]   27   34   41   48   55
## [3,]   41   52   63   74   85
## [4,]   55   70   85  100  115
## [5,]   69   88  107  126  145
```

```
D <- C%*%B
D
```

```
##      [,1] [,2]
## [1,]   95  110
## [2,]  220  260
```

```
det(D)
```

```
## [1] 500
```

```
solve(D)
```

```
##       [,1]  [,2]
## [1,]  0.52 -0.22
## [2,] -0.44  0.19
```

```
eigen(D) # gives eigen values and their associated eigen vectors
```

```
## eigen() decomposition
## $values
## [1] 353.585917   1.414083
##
## $vectors
##            [,1]       [,2]
## [1,] -0.3914450 -0.7616457
## [2,] -0.9202015  0.6479937
```

```
# Exercises
#1
abs(2**3 - 3**2)
```

```
## [1] 1
```

```
#2
exp(1)^exp(1)
```

```
## [1] 15.15426
```

```
#3
(2.3)^8 + log(0.75) - cos(pi/sqrt(2))
```

```
## [1] 783.4279
```

```
#4
A=matrix(c(1,2,3,2,2,1,6,4,4,7,2,5),nrow=3,ncol=4,byrow = TRUE)
A
```

```
##      [,1] [,2] [,3] [,4]
```

```
## [1,]    1    2    3    2
## [2,]    2    1    6    4
## [3,]    4    7    2    5
```

```
B=matrix(c(1,3,5,2,0,1,3,4,2,4,7,3,1,5,1,2),nrow=4,ncol=4,byrow = TRUE)
B
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    3    5    2
## [2,]    0    1    3    4
## [3,]    2    4    7    3
## [4,]    1    5    1    2
```

```
A%*%solve(B)
```

```
##      [,1]      [,2]      [,3]       [,4]
## [1,] -0.5 0.1739130 0.6956522  0.1086957
## [2,] -2.5 0.6086957 2.4347826 -0.3695652
## [3,] -6.0 0.3043478 4.2173913  1.5652174
```

```
B%*%t(A)
```

```
##      [,1] [,2] [,3]
## [1,]   26   43   45
## [2,]   19   35   33
## [3,]   37   62   65
## [4,]   18   21   51
```

```
#5
x<-matrix(c(2,5,6,7),nrow=4,ncol=1)
x
```

```
##      [,1]
## [1,]    2
## [2,]    5
## [3,]    6
## [4,]    7
```

```
y<-matrix(c(-1,3,-1,-1),nrow=4,ncol=1)
y
```

```
##      [,1]
## [1,]   -1
## [2,]    3
## [3,]   -1
## [4,]   -1
```

```
t(x)%*%y
```

```
##      [,1]
## [1,]    0
```

```
## Chapter 3

mykids <- c("Stephen", "Christopher")
mykids
```

```
## [1] "Stephen"     "Christopher"
```

```r
# Sequences
1:9
```

```
## [1] 1 2 3 4 5 6 7 8 9
```

```r
1.5:10
```

```
## [1] 1.5 2.5 3.5 4.5 5.5 6.5 7.5 8.5 9.5
```

```r
c(1.5:10,10)
```

```
##  [1]  1.5  2.5  3.5  4.5  5.5  6.5  7.5  8.5  9.5 10.0
```

```r
prod(1:8) # same as factorial(8)
```

```
## [1] 40320
```

```r
seq(1,5)
```

```
## [1] 1 2 3 4 5
```

```r
seq(1,5,by=.5)
```

```
## [1] 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0
```

```r
seq(1,5,length=7)
```

```
## [1] 1.000000 1.666667 2.333333 3.000000 3.666667 4.333333 5.000000
```

```r
rep(10,10) # repeat the value 10 ten times
```

```
##  [1] 10 10 10 10 10 10 10 10 10 10
```

```r
rep(c("A","B","C","D"),2) # repeat the string A,B,C,D twice
```

```
## [1] "A" "B" "C" "D" "A" "B" "C" "D"
```

```r
matrix(rep(0,16),nrow=4)
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    0    0    0    0
## [2,]    0    0    0    0
## [3,]    0    0    0    0
## [4,]    0    0    0    0
```

```r
# Reading in data
#passengers<-scan()
#passengers
passengers<-scan("/home/sathvik/EC8/ML/Lab/Lab1/data.txt")
passengers
```

```
##  [1] 2 4 0 1 1 2 3 1 0 0 3 2 1 2 1 0 2 1 1 2 0 0 1 3 2 2 3 1 0 3
```

```r
# Data frames
#new.data <- data.frame()
#new.data <- edit(new.data)

seatbelt <- c("Y","N","Y","Y","Y","Y","Y","Y","Y","Y", "N","Y","Y","Y","Y","Y","Y","Y","Y","Y","Y","Y",
car.dat <- data.frame(passengers,seatbelt)
car.dat
```

```
##    passengers seatbelt
## 1           2        Y
```

```
## 2           4        N
## 3           0        Y
## 4           1        Y
## 5           1        Y
## 6           2        Y
## 7           3        Y
## 8           1        Y
## 9           0        Y
## 10          0        Y
## 11          3        N
## 12          2        Y
## 13          1        Y
## 14          2        Y
## 15          1        Y
## 16          0        Y
## 17          2        Y
## 18          1        Y
## 19          1        Y
## 20          2        Y
## 21          0        Y
## 22          0        Y
## 23          1        Y
## 24          3        Y
## 25          2        Y
## 26          2        N
## 27          3        Y
## 28          1        Y
## 29          0        Y
## 30          3        Y
```

```
data(trees)
trees
```

```
##    Girth Height Volume
## 1    8.3     70   10.3
## 2    8.6     65   10.3
## 3    8.8     63   10.2
## 4   10.5     72   16.4
## 5   10.7     81   18.8
## 6   10.8     83   19.7
## 7   11.0     66   15.6
## 8   11.0     75   18.2
## 9   11.1     80   22.6
## 10  11.2     75   19.9
## 11  11.3     79   24.2
## 12  11.4     76   21.0
## 13  11.4     76   21.4
## 14  11.7     69   21.3
## 15  12.0     75   19.1
## 16  12.9     74   22.2
## 17  12.9     85   33.8
## 18  13.3     86   27.4
## 19  13.7     71   25.7
## 20  13.8     64   24.9
## 21  14.0     78   34.5
```

```
## 22  14.2     80   31.7
## 23  14.5     74   36.3
## 24  16.0     72   38.3
## 25  16.3     77   42.6
## 26  17.3     81   55.4
## 27  17.5     82   55.7
## 28  17.9     80   58.3
## 29  18.0     80   51.5
## 30  18.0     80   51.0
## 31  20.6     87   77.0
```

```
trees$Height
```

```
##  [1] 70 65 63 72 81 83 66 75 80 75 79 76 76 69 75 74 85 86 71 64 78 80 74 72 77
## [26] 81 82 80 80 80 87
```

```
sum(trees$Height)
```

```
## [1] 2356
```

```
trees[4,3]
```

```
## [1] 16.4
```

```
trees[4,]
```

```
##   Girth Height Volume
## 4  10.5     72   16.4
```

```
attach(trees)
Height
```

```
##  [1] 70 65 63 72 81 83 66 75 80 75 79 76 76 69 75 74 85 86 71 64 78 80 74 72 77
## [26] 81 82 80 80 80 87
```

```
search()
```

```
##  [1] ".GlobalEnv"        "trees"             "package:stats"
##  [4] "package:graphics"  "package:grDevices" "package:utils"
##  [7] "package:datasets"  "package:methods"   "Autoloads"
## [10] "package:base"
```

```
attributes(trees)
```

```
## $names
## [1] "Girth"  "Height" "Volume"
##
## $class
## [1] "data.frame"
##
## $row.names
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
## [26] 26 27 28 29 30 31
```

```
Height[Height > 75]
```

```
##  [1] 81 83 80 79 76 76 85 86 78 80 77 81 82 80 80 80 87
```

```
#smith <- read.table(file.choose(), header=T)
#smith
#attributes(smith)
```

```r
# Exercises

#1a
rep(c(1,2,3),3)
```

```
## [1] 1 2 3 1 2 3 1 2 3
```

```r
#1b
seq(10,10.5,length=12)
```

```
##  [1] 10.00000 10.04545 10.09091 10.13636 10.18182 10.22727 10.27273 10.31818
##  [9] 10.36364 10.40909 10.45455 10.50000
```

```r
#1c
rep(c(1,2,3,"banana"),2)
```

```
## [1] "1"      "2"      "3"      "banana" "1"      "2"      "3"      "banana"
```

```r
#2
blahblah <- scan() # 10 no.s between 1 and 100
blahblah
```

```
## numeric(0)
```

```r
#3
coursenumber <- c(871,347,348)
coursedays <- c("MWT","MTF","WT")
grade <- c("AA","AB","AB")
schedule <- data.frame(coursenumber,coursedays,grade)
schedule
```

```
##   coursenumber coursedays grade
## 1          871        MWT    AA
## 2          347        MTF    AB
## 3          348         WT    AB
```

```r
#4
data("stackloss")
attach(stackloss)
```

```
## The following object is masked _by_ .GlobalEnv:
##
##     stack.loss
```

```
## The following object is masked from package:datasets:
##
##     stack.loss
```

```r
tempacid <- data.frame(Water.Temp,Acid.Conc.)
tempacid
```

```
##    Water.Temp Acid.Conc.
## 1          27         89
## 2          27         88
## 3          25         90
## 4          24         87
## 5          22         87
## 6          23         87
## 7          24         93
```

```
## 8          24         93
## 9          23         87
## 10         18         80
## 11         18         89
## 12         17         88
## 13         18         82
## 14         19         93
## 15         18         89
## 16         18         86
## 17         19         72
## 18         19         79
## 19         20         80
## 20         20         82
## 21         20         91
```