Homework_1,_Assignments.R

George

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```
# Homework Assignment (George Redak)

# 1.a.
```

```
#create vector u

u <- 1:9
u <-sample(u, 3)
u
```

```
## [1] 6 8 1
```

create vector v

```
v <- 1:9
v <-sample(v, 3)
v
```

```
## [1] 6 3 9
```

1.b.

```
# u subtract v
u-v
```

```
## [1]  0  5 -8
```

1.c.

```
u%*%v
```

```
##      [,1]
## [1,]   69
```

1.d.

```
# create new vector called t (u+v)
t<- u+v
t
```

```
## [1] 12 11 10
```

```r
#find mean of t
mean(t)
```

```
## [1] 11
```

```r
#replace numbers with 0
t[which(t>8.66667)] <- 0
t
```

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

2.a.

```r
#create radom permutation
s <-1:6
s <-sample(s, 6)
s
```

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

```r
#make matrix with random permutation vector
m <- matrix(s, nrow=2)
m
```

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

2.b

```r
# use %*% to get dot product of m and u and assign it to new variable
at <- m %*% u
at
```

```
##      [,1]
## [1,]   41
## [2,]   70
```

2.c.

```r
# dot product of u and tranpose of m and assign to new variable
ar <- u %*% t(m)
ar
```

```
##      [,1] [,2]
## [1,]   41   70
```

```r
am <- t(m)
```

```r
# the result of m times u is equal to the transposed result of t(m) and u
# m%*%u=t(u %*% am)
m%*%u==t(u %*% am)
```

```
##      [,1]
## [1,] TRUE
## [2,] TRUE
```

```
t(ar) == at
```

```
##      [,1]
## [1,] TRUE
## [2,] TRUE
```

2.d

m %*% m #error because the number of rows and columns are the same for both matrices #transpose m would make it work

```
m %*% t(m)
```

```
##      [,1] [,2]
## [1,]   35   40
## [2,]   40   56
```

3.a.

```
#Random Permutation for Row 3
Number <- 1:12
Number<- Number2 <-sample(Number, 12)
# duplicate variable for future use

Number
```

```
##  [1]  7  4 10  8  5  6  2  1  9 11  3 12
```

```
Number2
```

```
##  [1]  7  4 10  8  5  6  2  1  9 11  3 12
```

```
#Unique characters for Row 2
Unique <- letters[seq( from = 1, to = 12 )]

#Get day for Row 1

require(lubridate)
```

```
## Loading required package: lubridate
```

```
##
## Attaching package: 'lubridate'
```

```
## The following object is masked from 'package:base':
##
##     date
```

```
# add the times for date row
time1 <- ymd(c("3025-01-31", "3025-02-28", "3025-03-31", "3025-04-30", "3025-05-31", "3025-06-30", "3025
time1
```

```
##  [1] "3025-01-31" "3025-02-28" "3025-03-31" "3025-04-30" "3025-05-31"
##  [6] "3025-06-30" "3025-07-31" "3025-08-31" "3025-09-30" "3025-10-31"
## [11] "3025-11-30" "3025-12-31"
```

```
#find what day is each date
time2<- day(ymd(time1))
time25 <- wday(time1, label = TRUE)
time25
```

```
##  [1] Mon   Mon   Thurs Sat   Tues  Thurs Sun   Wed   Fri   Mon   Wed
## [12] Sat
## Levels: Sun < Mon < Tues < Wed < Thurs < Fri < Sat
```

```
#create data frame
df1 <- df2 <- data.frame(time1, Unique, Number)
colnames(df1) <- c("Day", "Unique", "Number")
rownames(df1) <- c(1:12)

df1
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

```
#data frame structure
str(df1)
```

```
## 'data.frame':    12 obs. of  3 variables:
##  $ Day   : Date, format: "3025-01-31" "3025-02-28" ...
##  $ Unique: Factor w/ 12 levels "a","b","c","d",..: 1 2 3 4 5 6 7 8 9 10 ...
##  $ Number: int  7 4 10 8 5 6 2 1 9 11 ...
```

```
#randomize rows
df2 <- df1[sample(nrow(df1)),]
df3 <- df1[sample(nrow(df1)),]
df1
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
```

```
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

```
df2
```

```
##           Day Unique Number
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 6  3025-06-30      f      6
## 8  3025-08-31      h      1
## 2  3025-02-28      b      4
## 1  3025-01-31      a      7
## 9  3025-09-30      i      9
## 3  3025-03-31      c     10
## 12 3025-12-31      l     12
## 7  3025-07-31      g      2
```

```
df3
```

```
##           Day Unique Number
## 12 3025-12-31      l     12
## 4  3025-04-30      d      8
## 2  3025-02-28      b      4
## 6  3025-06-30      f      6
## 9  3025-09-30      i      9
## 3  3025-03-31      c     10
## 5  3025-05-31      e      5
## 8  3025-08-31      h      1
## 10 3025-10-31      j     11
## 7  3025-07-31      g      2
## 1  3025-01-31      a      7
## 11 3025-11-30      k      3
```

3.b.

```
#save csv
write.csv(df1, file = "df1.csv")


#load csv
#duplicate data frane (df2 will be the same thing but with all even numbers being 0)
df1 <- df2 <- read.table(file="df1.csv",header=TRUE,sep=",", row.names = 1 ,stringsAsFactors=FALSE)
df1
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
```

```
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

```
df2
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

3.c.

```
# find out what quarter each month is in and assign it to a variable
quarters <- quarter(df1[, 1])
quarters
```

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

```
#generate random quarter and assign it to a varaible
variable <- sample(quarters, 1)
variable
```

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

```
#replace Day column with quarters variable
df1[, "Day"] <- quarters
df1
```

```
##    Day Unique Number
## 1    1      a      7
## 2    1      b      4
## 3    1      c     10
## 4    2      d      8
## 5    2      e      5
## 6    2      f      6
## 7    3      g      2
## 8    3      h      1
## 9    3      i      9
## 10   4      j     11
## 11   4      k      3
## 12   4      l     12
```

```
# match new data.frame "Day" column to the random quarter assigned earlier
variable2 <- match(df1[, "Day"], variable)
```

```
variable2
```

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

```
#return the "Day" column to the orgiginal time format
df1[, "Day"] <- time1
df1
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

```
#select the specific columns in quarter
dfq <- df1[c(4:6), c("Day", "Number")]
dfq
```

```
##          Day Number
## 4 3025-04-30      8
## 5 3025-05-31      5
## 6 3025-06-30      6
```

3.d.

```
#replace all even Numbers in column with 0
#find all even numbers and replace them with 0 in the Number vector

Number2[which(Number2 %% 2 == 0)] <- 0
Number2
```

```
##  [1]  7  0  0  0  5  0  0  1  9 11  3  0
```

```
#replace the"Number" column with new number vector
df2[, "Number"] <- Number2

df2
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      0
## 3  3025-03-31      c      0
## 4  3025-04-30      d      0
## 5  3025-05-31      e      5
## 6  3025-06-30      f      0
## 7  3025-07-31      g      0
## 8  3025-08-31      h      1
```

```
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l      0
```

```
df1
```

```
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

3.e.

```
#create list with U, v, m, df1

list1 <- list(u, v, m, df1)
list1
```

```
## [[1]]
## [1] 6 8 1
##
## [[2]]
## [1] 6 3 9
##
## [[3]]
##      [,1] [,2] [,3]
## [1,]    5    1    3
## [2,]    6    4    2
##
## [[4]]
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

```r
#name list
names(list1) <- c("Vector u", "Vector v", "Matrix m", "Data Frame")
list1
```

```
## $`Vector u`
## [1] 6 8 1
##
## $`Vector v`
## [1] 6 3 9
##
## $`Matrix m`
##      [,1] [,2] [,3]
## [1,]    5    1    3
## [2,]    6    4    2
##
## $`Data Frame`
##           Day Unique Number
## 1  3025-01-31      a      7
## 2  3025-02-28      b      4
## 3  3025-03-31      c     10
## 4  3025-04-30      d      8
## 5  3025-05-31      e      5
## 6  3025-06-30      f      6
## 7  3025-07-31      g      2
## 8  3025-08-31      h      1
## 9  3025-09-30      i      9
## 10 3025-10-31      j     11
## 11 3025-11-30      k      3
## 12 3025-12-31      l     12
```

```r
#choose the third's item second item
list1[[3]][, 2]
```

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

3.f.

```r
class(list1[[3]])
```

```
## [1] "matrix"
```

```r
class(list1[3])
```

```
## [1] "list"
```

```
##      [[3]] vs [3]
##      [3] gives Matrix m as an element within the list,
##      [[3]] gives us Matrix M as the matrix element that exists outside the list
```

4

$$x = \frac{-b +/- \sqrt{b^2 - 4ac}}{2a}$$

‘‘