Homework\_1,\_Assignments.R

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# Homework Assignment (George Redak)  
  
# 1.a.  
#create vector u

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

## [1] 5 4 1

#create vecotr v  
v <- 1:9  
v <-sample(v, 3)  
v

## [1] 1 8 9

# 1.b.  
u-v

## [1] 4 -4 -8

# 1.c.  
u%\*%v

## [,1]  
## [1,] 46

# 1.d.  
t<- u+v  
t

## [1] 6 12 10

mean(t)

## [1] 9.333333

t[which(t>8.66667)] <- 0  
t

## [1] 6 0 0

# 2.a.  
#create radom permutation  
s <-1:6  
s <-sample(s, 6)  
s

## [1] 1 3 2 4 5 6

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

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

# 2.b  
at <- m %\*% u  
at

## [,1]  
## [1,] 18  
## [2,] 37

# 2.c.  
ar <- u %\*% t(m)  
ar

## [,1] [,2]  
## [1,] 18 37

am <- t(m)

# 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,] 30 41  
## [2,] 41 61

# 3.a.

#Random Permutation for Row 3  
Number <- 1:12  
Number<- Number2 <-sample(Number, 12)  
Number

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

Number2

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

#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

time1 <- ymd(c("3025-01-31", "3025-02-28", "3025-03-31", "3025-04-30", "3025-05-31", "3025-06-30", "3025-07-31", "3025-08-31", "3025-09-30", "3025-10-31", "3025-11-30", "3025-12-31"))  
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"

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(1:12,rep(3),c(2))  
df1

## X1.12 rep.3. c.2.  
## 1 1 3 2  
## 2 2 3 2  
## 3 3 3 2  
## 4 4 3 2  
## 5 5 3 2  
## 6 6 3 2  
## 7 7 3 2  
## 8 8 3 2  
## 9 9 3 2  
## 10 10 3 2  
## 11 11 3 2  
## 12 12 3 2

colnames(df1) <- c("Day", "Unique", "Number")  
rownames(df1) <- c(1:12)  
  
df1

## Day Unique Number  
## 1 1 3 2  
## 2 2 3 2  
## 3 3 3 2  
## 4 4 3 2  
## 5 5 3 2  
## 6 6 3 2  
## 7 7 3 2  
## 8 8 3 2  
## 9 9 3 2  
## 10 10 3 2  
## 11 11 3 2  
## 12 12 3 2

#assign values to columns  
  
df1[, "Number"] <- Number  
df1[, "Day"] <- time1  
df1[, "Unique"] <- Unique  
df1

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

#data frame structure  
str(df1)

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

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

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

df2

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

df3

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

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

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

#load csv  
df1 <- df2 <- read.table(file="df1.csv",header=TRUE,sep=",", row.names = 1 ,stringsAsFactors=FALSE)  
df1

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

df2

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

#3.c.  
quarters <- quarter(df1[, 1])  
quarters

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

variable <- sample(quarters, 1)  
variable

## [1] 1

df1[, "Day"] <- quarters  
df1

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

variable2 <- match(df1[, "Day"], variable)  
variable2

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

df1[, "Day"] <- time1  
df1

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

#select the specific columns in quarter  
dfq <- df1[c(10:12), c("Day", "Number")]  
dfq

## Day Number  
## 10 3025-10-31 1  
## 11 3025-11-30 5  
## 12 3025-12-31 11

# 3.d.   
#replace all even Numbers in column with 0  
#find all even numbers and replace them with 0 in the Number vector  
  
Number[which(Number %% 2 == 0)] <- 0  
Number

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

#use second database to keep the original  
  
df2[, "Number"] <- Number  
  
df2

## Day Unique Number  
## 1 3025-01-31 a 0  
## 2 3025-02-28 b 0  
## 3 3025-03-31 c 3  
## 4 3025-04-30 d 7  
## 5 3025-05-31 e 0  
## 6 3025-06-30 f 0  
## 7 3025-07-31 g 0  
## 8 3025-08-31 h 0  
## 9 3025-09-30 i 9  
## 10 3025-10-31 j 1  
## 11 3025-11-30 k 5  
## 12 3025-12-31 l 11

df1

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

# 3.e.   
  
#create list with  
  
list1 <- list(u, v, m, df1)  
list1

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

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

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

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

## [1] 2 4

# 3.f.  
class(list1[[3]])

## [1] "matrix"

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

$$p(x; \mu, \sigma) = \frac{1}{\sigma \sqrt{2 \pi}} eˆ{\frac{-(x-\mu)ˆ2}{2 \sigmaˆ2}}$$

```