Practical 1

Harshal Marathe

2023-08-09

#Questions

##Q1

rm(list=ls())  
tourist <- matrix(data=c(9.303,9.536,9.918,7.959,7.736,8.875,15.224,15.629,16.090,0.905,0.894,0.883,7.463,18.635,20.148),nrow=5,byrow=T)  
dim(tourist)

## [1] 5 3

Nationality <- c("germany","France","Great Britain","USA","Rest of the world")  
year <- c("2003","2004","2005")  
dimnames(tourist) <- list(Nationality,year)  
tourist

## 2003 2004 2005  
## germany 9.303 9.536 9.918  
## France 7.959 7.736 8.875  
## Great Britain 15.224 15.629 16.090  
## USA 0.905 0.894 0.883  
## Rest of the world 7.463 18.635 20.148

#row sum  
row\_sum <- apply(tourist,1,sum)  
row\_sum

## germany France Great Britain USA   
## 28.757 24.570 46.943 2.682   
## Rest of the world   
## 46.246

#col\_sum   
col\_sum<- apply(tourist,2,sum)  
col\_sum

## 2003 2004 2005   
## 40.854 52.430 55.914

#row means  
row\_mean=apply(tourist,1,mean)  
row\_mean

## germany France Great Britain USA   
## 9.585667 8.190000 15.647667 0.894000   
## Rest of the world   
## 15.415333

#Or  
#rowMeans(tourist)  
  
  
#col means  
col\_means=apply(tourist,2,mean)  
col\_means

## 2003 2004 2005   
## 8.1708 10.4860 11.1828

#or  
#colMeans(tourist)

##Q2

#A=coefficient of X,y,z)  
A <- matrix(c(3,2,1,2,-3,1,1,1,1),nrow=3,byrow=T)  
#B=answer of the solution)  
B <- matrix(c(10,-1,6),nrow=3)  
#Values of X ,Y and Z  
U=solve(A,B)  
data.frame(W=c('X','Y','Z'),U)

## W U  
## 1 X 1  
## 2 Y 2  
## 3 Z 3

#to find regular inverse  
solve(A)%\*%A

## [,1] [,2] [,3]  
## [1,] 1.000000e+00 -1.110223e-16 0  
## [2,] 1.387779e-17 1.000000e+00 0  
## [3,] 0.000000e+00 0.000000e+00 1

##Q3

age <- c(25,30,18)  
gender <- c("M","F","F")  
weight<- c(116,115,120)  
#cbind  
S <- cbind(age,gender,weight)  
S

## age gender weight  
## [1,] "25" "M" "116"   
## [2,] "30" "F" "115"   
## [3,] "18" "F" "120"

#rbind  
W <- rbind(age,gender,weight)  
t(W)

## age gender weight  
## [1,] "25" "M" "116"   
## [2,] "30" "F" "115"   
## [3,] "18" "F" "120"

#data.frame  
Y <- data.frame(age,gender,weight)  
Y

## age gender weight  
## 1 25 M 116  
## 2 30 F 115  
## 3 18 F 120

#is.data.frame- to check whether is it data frame or not   
is.data.frame(Y)

## [1] TRUE

#as.matrix(Y)- changes a data frame to matrix  
as.matrix(Y)

## age gender weight  
## [1,] "25" "M" "116"   
## [2,] "30" "F" "115"   
## [3,] "18" "F" "120"

#is.matrix(Y)- to check whether is it a matrix or not  
is.matrix(Y)

## [1] FALSE

#another way  
#my\_data <- data.frame(age=numeric(0),gender=character(0),weight=numeric(0))  
#my\_data <- edit(my\_data)  
  
#another way  
my\_data\_txt <- "  
age gender weight  
25 M 166  
30 F 115  
18 F 120  
"  
mydata\_=read.table(header=T,text= my\_data\_txt)  
mydata\_

## age gender weight  
## 1 25 M 166  
## 2 30 F 115  
## 3 18 F 120

##Q4

#data.frame  
Manager <- c(1:5)  
date <- c("10/24/08","10/28/08","10/01/08","10/12/08","05/01/09")  
Country <- c("US","US","UK","UK","UK")  
Gender <- c("M","F","F","M","F")  
Age <- c(32,45,25,39,99)  
q1 <- c(5,3,3,3,2)  
q2 <- c(4,5,5,3,2)  
q3 <- c(5,2,5,4,1)  
q4 <- c(5,5,5,NA,2)  
q5 <- c(5,5,2,NA,1)  
Y <- data.frame(Manager,date,Country,Gender,Age,q1,q2,q3,q4,q5)  
Y

## Manager date Country Gender Age q1 q2 q3 q4 q5  
## 1 1 10/24/08 US M 32 5 4 5 5 5  
## 2 2 10/28/08 US F 45 3 5 2 5 5  
## 3 3 10/01/08 UK F 25 3 5 5 5 2  
## 4 4 10/12/08 UK M 39 3 3 4 NA NA  
## 5 5 05/01/09 UK F 99 2 2 1 2 1

my\_data <- data.frame()  
#D1 <- data.frame(Manager=numeric(0),date=character(0),Country=character(0),Gender=character(0),Age=numeric(0),q1=numeric(0),q2=numeric(0),q3=numeric(0),q4=numeric(0),q5=numeric(0))  
#de <- edit(D1)  
#print(de)  
  
#another way  
mydata <- "  
Manager date Country Gender Age q1 q2 q3 q4 q5  
1 10/24/08 US M 32 5 3 3 3 2  
  
  
  
  
"

##Q5

library(MASS)  
data(Cars93)  
fix(Cars93)  
head(Cars93,n=10)

## Manufacturer Model Type Min.Price Price Max.Price MPG.city  
## 1 Acura Integra Small 12.9 15.9 18.8 25  
## 2 Acura Legend Midsize 29.2 33.9 38.7 18  
## 3 Audi 90 Compact 25.9 29.1 32.3 20  
## 4 Audi 100 Midsize 30.8 37.7 44.6 19  
## 5 BMW 535i Midsize 23.7 30.0 36.2 22  
## 6 Buick Century Midsize 14.2 15.7 17.3 22  
## 7 Buick LeSabre Large 19.9 20.8 21.7 19  
## 8 Buick Roadmaster Large 22.6 23.7 24.9 16  
## 9 Buick Riviera Midsize 26.3 26.3 26.3 19  
## 10 Cadillac DeVille Large 33.0 34.7 36.3 16  
## MPG.highway AirBags DriveTrain Cylinders EngineSize Horsepower  
## 1 31 None Front 4 1.8 140  
## 2 25 Driver & Passenger Front 6 3.2 200  
## 3 26 Driver only Front 6 2.8 172  
## 4 26 Driver & Passenger Front 6 2.8 172  
## 5 30 Driver only Rear 4 3.5 208  
## 6 31 Driver only Front 4 2.2 110  
## 7 28 Driver only Front 6 3.8 170  
## 8 25 Driver only Rear 6 5.7 180  
## 9 27 Driver only Front 6 3.8 170  
## 10 25 Driver only Front 8 4.9 200  
## RPM Rev.per.mile Man.trans.avail Fuel.tank.capacity Passengers Length  
## 1 6300 2890 Yes 13.2 5 177  
## 2 5500 2335 Yes 18.0 5 195  
## 3 5500 2280 Yes 16.9 5 180  
## 4 5500 2535 Yes 21.1 6 193  
## 5 5700 2545 Yes 21.1 4 186  
## 6 5200 2565 No 16.4 6 189  
## 7 4800 1570 No 18.0 6 200  
## 8 4000 1320 No 23.0 6 216  
## 9 4800 1690 No 18.8 5 198  
## 10 4100 1510 No 18.0 6 206  
## Wheelbase Width Turn.circle Rear.seat.room Luggage.room Weight Origin  
## 1 102 68 37 26.5 11 2705 non-USA  
## 2 115 71 38 30.0 15 3560 non-USA  
## 3 102 67 37 28.0 14 3375 non-USA  
## 4 106 70 37 31.0 17 3405 non-USA  
## 5 109 69 39 27.0 13 3640 non-USA  
## 6 105 69 41 28.0 16 2880 USA  
## 7 111 74 42 30.5 17 3470 USA  
## 8 116 78 45 30.5 21 4105 USA  
## 9 108 73 41 26.5 14 3495 USA  
## 10 114 73 43 35.0 18 3620 USA  
## Make  
## 1 Acura Integra  
## 2 Acura Legend  
## 3 Audi 90  
## 4 Audi 100  
## 5 BMW 535i  
## 6 Buick Century  
## 7 Buick LeSabre  
## 8 Buick Roadmaster  
## 9 Buick Riviera  
## 10 Cadillac DeVille

tail(Cars93)

## Manufacturer Model Type Min.Price Price Max.Price MPG.city MPG.highway  
## 88 Volkswagen Fox Small 8.7 9.1 9.5 25 33  
## 89 Volkswagen Eurovan Van 16.6 19.7 22.7 17 21  
## 90 Volkswagen Passat Compact 17.6 20.0 22.4 21 30  
## 91 Volkswagen Corrado Sporty 22.9 23.3 23.7 18 25  
## 92 Volvo 240 Compact 21.8 22.7 23.5 21 28  
## 93 Volvo 850 Midsize 24.8 26.7 28.5 20 28  
## AirBags DriveTrain Cylinders EngineSize Horsepower RPM  
## 88 None Front 4 1.8 81 5500  
## 89 None Front 5 2.5 109 4500  
## 90 None Front 4 2.0 134 5800  
## 91 None Front 6 2.8 178 5800  
## 92 Driver only Rear 4 2.3 114 5400  
## 93 Driver & Passenger Front 5 2.4 168 6200  
## Rev.per.mile Man.trans.avail Fuel.tank.capacity Passengers Length Wheelbase  
## 88 2550 Yes 12.4 4 163 93  
## 89 2915 Yes 21.1 7 187 115  
## 90 2685 Yes 18.5 5 180 103  
## 91 2385 Yes 18.5 4 159 97  
## 92 2215 Yes 15.8 5 190 104  
## 93 2310 Yes 19.3 5 184 105  
## Width Turn.circle Rear.seat.room Luggage.room Weight Origin  
## 88 63 34 26.0 10 2240 non-USA  
## 89 72 38 34.0 NA 3960 non-USA  
## 90 67 35 31.5 14 2985 non-USA  
## 91 66 36 26.0 15 2810 non-USA  
## 92 67 37 29.5 14 2985 non-USA  
## 93 69 38 30.0 15 3245 non-USA  
## Make  
## 88 Volkswagen Fox  
## 89 Volkswagen Eurovan  
## 90 Volkswagen Passat  
## 91 Volkswagen Corrado  
## 92 Volvo 240  
## 93 Volvo 850

###a)  
attach(Cars93)  
# 2x2 contigency table  
table(Origin,AirBags)

## AirBags  
## Origin Driver & Passenger Driver only None  
## USA 9 23 16  
## non-USA 7 20 18

detach(Cars93)  
#Or  
table(Cars93$Origin,Cars93$AirBags)

##   
## Driver & Passenger Driver only None  
## USA 9 23 16  
## non-USA 7 20 18

###b)  
attach(Cars93)  
ftable(Origin,AirBags,DriveTrain)

## DriveTrain 4WD Front Rear  
## Origin AirBags   
## USA Driver & Passenger 0 6 3  
## Driver only 3 15 5  
## None 2 13 1  
## non-USA Driver & Passenger 0 5 2  
## Driver only 2 13 5  
## None 3 15 0

detach(Cars93)  
#or  
tab <- ftable(Cars93$Origin,Cars93$AirBags,Cars93$DriveTrain)  
  
##c)  
#margin.table ?  
OA <- table(Cars93$Origin,Cars93$AirBags)  
OA

##   
## Driver & Passenger Driver only None  
## USA 9 23 16  
## non-USA 7 20 18

#sum of the table  
margin.table(OA,1)

##   
## USA non-USA   
## 48 45

margin.table(OA,2)

##   
## Driver & Passenger Driver only None   
## 16 43 34

#proportion of the table  
prop.table(OA)

##   
## Driver & Passenger Driver only None  
## USA 0.09677419 0.24731183 0.17204301  
## non-USA 0.07526882 0.21505376 0.19354839

prop.table(OA,1)

##   
## Driver & Passenger Driver only None  
## USA 0.1875000 0.4791667 0.3333333  
## non-USA 0.1555556 0.4444444 0.4000000

prop.table(OA,2)

##   
## Driver & Passenger Driver only None  
## USA 0.5625000 0.5348837 0.4705882  
## non-USA 0.4375000 0.4651163 0.5294118

##Q6

#install.packages("ISLR2")  
library(ISLR2)

## Warning: package 'ISLR2' was built under R version 4.2.3

##   
## Attaching package: 'ISLR2'

## The following object is masked from 'package:MASS':  
##   
## Boston

data(College)  
  
head(College)# dimensions of the table

## Private Apps Accept Enroll Top10perc Top25perc  
## Abilene Christian University Yes 1660 1232 721 23 52  
## Adelphi University Yes 2186 1924 512 16 29  
## Adrian College Yes 1428 1097 336 22 50  
## Agnes Scott College Yes 417 349 137 60 89  
## Alaska Pacific University Yes 193 146 55 16 44  
## Albertson College Yes 587 479 158 38 62  
## F.Undergrad P.Undergrad Outstate Room.Board Books  
## Abilene Christian University 2885 537 7440 3300 450  
## Adelphi University 2683 1227 12280 6450 750  
## Adrian College 1036 99 11250 3750 400  
## Agnes Scott College 510 63 12960 5450 450  
## Alaska Pacific University 249 869 7560 4120 800  
## Albertson College 678 41 13500 3335 500  
## Personal PhD Terminal S.F.Ratio perc.alumni Expend  
## Abilene Christian University 2200 70 78 18.1 12 7041  
## Adelphi University 1500 29 30 12.2 16 10527  
## Adrian College 1165 53 66 12.9 30 8735  
## Agnes Scott College 875 92 97 7.7 37 19016  
## Alaska Pacific University 1500 76 72 11.9 2 10922  
## Albertson College 675 67 73 9.4 11 9727  
## Grad.Rate  
## Abilene Christian University 60  
## Adelphi University 56  
## Adrian College 54  
## Agnes Scott College 59  
## Alaska Pacific University 15  
## Albertson College 55

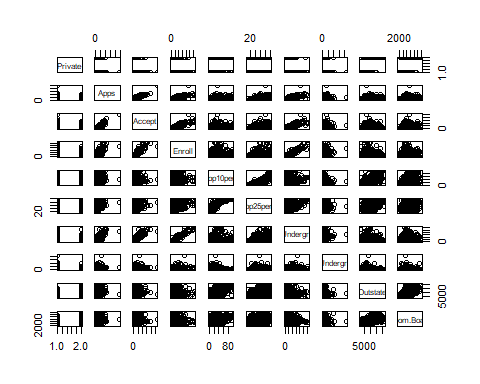
dim(College)

## [1] 777 18

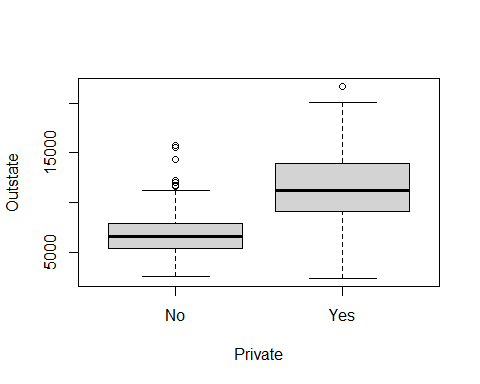
#a)  
summary(College)

## Private Apps Accept Enroll Top10perc   
## No :212 Min. : 81 Min. : 72 Min. : 35 Min. : 1.00   
## Yes:565 1st Qu.: 776 1st Qu.: 604 1st Qu.: 242 1st Qu.:15.00   
## Median : 1558 Median : 1110 Median : 434 Median :23.00   
## Mean : 3002 Mean : 2019 Mean : 780 Mean :27.56   
## 3rd Qu.: 3624 3rd Qu.: 2424 3rd Qu.: 902 3rd Qu.:35.00   
## Max. :48094 Max. :26330 Max. :6392 Max. :96.00   
## Top25perc F.Undergrad P.Undergrad Outstate   
## Min. : 9.0 Min. : 139 Min. : 1.0 Min. : 2340   
## 1st Qu.: 41.0 1st Qu.: 992 1st Qu.: 95.0 1st Qu.: 7320   
## Median : 54.0 Median : 1707 Median : 353.0 Median : 9990   
## Mean : 55.8 Mean : 3700 Mean : 855.3 Mean :10441   
## 3rd Qu.: 69.0 3rd Qu.: 4005 3rd Qu.: 967.0 3rd Qu.:12925   
## Max. :100.0 Max. :31643 Max. :21836.0 Max. :21700   
## Room.Board Books Personal PhD   
## Min. :1780 Min. : 96.0 Min. : 250 Min. : 8.00   
## 1st Qu.:3597 1st Qu.: 470.0 1st Qu.: 850 1st Qu.: 62.00   
## Median :4200 Median : 500.0 Median :1200 Median : 75.00   
## Mean :4358 Mean : 549.4 Mean :1341 Mean : 72.66   
## 3rd Qu.:5050 3rd Qu.: 600.0 3rd Qu.:1700 3rd Qu.: 85.00   
## Max. :8124 Max. :2340.0 Max. :6800 Max. :103.00   
## Terminal S.F.Ratio perc.alumni Expend   
## Min. : 24.0 Min. : 2.50 Min. : 0.00 Min. : 3186   
## 1st Qu.: 71.0 1st Qu.:11.50 1st Qu.:13.00 1st Qu.: 6751   
## Median : 82.0 Median :13.60 Median :21.00 Median : 8377   
## Mean : 79.7 Mean :14.09 Mean :22.74 Mean : 9660   
## 3rd Qu.: 92.0 3rd Qu.:16.50 3rd Qu.:31.00 3rd Qu.:10830   
## Max. :100.0 Max. :39.80 Max. :64.00 Max. :56233   
## Grad.Rate   
## Min. : 10.00   
## 1st Qu.: 53.00   
## Median : 65.00   
## Mean : 65.46   
## 3rd Qu.: 78.00   
## Max. :118.00

#b)Scatter plot  
pairs(College[,1:10])



#c)  
boxplot(Outstate~Private,data=College)



#d)  
Eliteclass <- ifelse(College$Top10perc>50,"Elite","Not Elite")