### HW5 ###

### Wenhui Yang ###

### 2/12/2019 ###

**# Exerciese 1**

a <- 1:9

A <- matrix(a^2,3,3,byrow=TRUE)

B <- matrix(a^2,3,3,byrow=FALSE)

C <- col(A) >= row(A)

A\*C

> A

[,1] [,2] [,3]

[1,] 1 4 9

[2,] 16 25 36

[3,] 49 64 81

> B

[,1] [,2] [,3]

[1,] 1 16 49

[2,] 4 25 64

[3,] 9 36 81

> A\*C

[,1] [,2] [,3]

[1,] 1 4 9

[2,] 0 25 36

[3,] 0 0 81

**# Exerciese 2**

Storrs <- c(365, 489)

Hartford <- c(426, 387)

Stamford <- c(571, 486)

HP\_vector <- c(Storrs,Hartford,Stamford)

HP\_matrix <- matrix(HP\_vector,ncol = 2,nrow = 3, byrow = TRUE)

Area <- c("Storrs","Hartford","Stamford")

Type <-c("House","Condo")

rownames(HP\_matrix) <- Area

colnames(HP\_matrix) <- Type

> HP\_matrix

House Condo

Storrs 365 489

Hartford 426 387

Stamford 571 486

CT\_average\_type <- colMeans(HP\_matrix)

HP\_matrix.2 <- rbind(HP\_matrix,CT\_average\_type)

> HP\_matrix.2

House Condo

Storrs 365 489

Hartford 426 387

Stamford 571 486

CT\_average\_type 454 454

CT\_average\_area <- rowMeans(HP\_matrix.2)

HP\_matrix.f <- cbind(HP\_matrix.2,CT\_average\_area)

> HP\_matrix.f

House Condo CT\_average\_area

Storrs 365 489 427.0

Hartford 426 387 406.5

Stamford 571 486 528.5

CT\_average\_type 454 454 454.0

**# Exercise 3**

income <- rchisq(100,5)

yrsofedu <- sample(7:16,100,replace = T)

CT <- cbind(income,yrsofedu)

gender <- sample(c("Male","Female"),100,replace = T)

cbind(CT,gender)

CT1 <- CT[gender == "Female",]

CT2 <- CT[CT[,2]>12,]

colMeans(CT)

colMeans(CT1)

> cbind(CT,gender)

income yrsofedu gender

[1,] "1.44425104024353" "13" "Female"

[2,] "9.05269526835123" "13" "Male"

[3,] "4.79798435828873" "15" "Female"

[4,] "1.43460843919158" "8" "Female"

[5,] "2.42849096739181" "7" "Female"

[6,] "9.38167473539245" "14" "Male"

[7,] "3.82463478347766" "13" "Male"

[8,] "0.893936755532762" "15" "Male"

[9,] "8.60240093021288" "10" "Female"

[10,] "5.76565559306487" "8" "Female"

[11,] "12.5023404979515" "10" "Male"

[12,] "10.9327150149069" "16" "Female"

[13,] "4.29085780573554" "10" "Female"

[14,] "3.82252311506355" "16" "Male"

[15,] "7.14227985734666" "7" "Male"

[16,] "2.72713995014408" "10" "Male"

[17,] "17.0568391638161" "11" "Male"

[18,] "3.04569752604443" "7" "Female"

[19,] "5.30550482931239" "13" "Female"

[20,] "5.3930741478059" "13" "Female"

[21,] "7.26847977104077" "13" "Male"

[22,] "5.29396848748763" "16" "Male"

[23,] "2.29235600142079" "11" "Female"

[24,] "1.03744585634128" "15" "Male"

[25,] "12.0106915225227" "8" "Female"

[26,] "8.4079343577508" "15" "Male"

[27,] "5.8717239442129" "13" "Male"

[28,] "9.20634832264377" "7" "Female"

[29,] "5.29720753209876" "8" "Male"

[30,] "3.7736082968592" "12" "Male"

[31,] "4.04971912251337" "13" "Male"

[32,] "6.28669709251587" "13" "Male"

[33,] "7.82377740760577" "16" "Female"

[34,] "2.69520715865947" "15" "Male"

[35,] "6.9736673397824" "14" "Female"

[36,] "6.15787467901421" "10" "Female"

[37,] "4.87686411863047" "12" "Female"

[38,] "4.76019144469938" "15" "Male"

[39,] "5.41704623079603" "11" "Male"

[40,] "1.67409821797219" "16" "Female"

[41,] "1.1660979643003" "10" "Female"

[42,] "8.59253639099027" "10" "Female"

[43,] "5.67638358260655" "13" "Male"

[44,] "2.57089378279394" "12" "Female"

[45,] "3.22301206270914" "14" "Male"

[46,] "3.30585651920014" "7" "Female"

[47,] "5.92611929712439" "13" "Female"

[48,] "5.31998537518625" "11" "Male"

[49,] "4.9105103037863" "9" "Male"

[50,] "2.49822845086212" "9" "Male"

[51,] "7.1362286832725" "8" "Female"

[52,] "7.64872045908318" "14" "Male"

[53,] "14.1444173049679" "14" "Female"

[54,] "5.51507983761985" "9" "Female"

[55,] "5.04432043602969" "11" "Male"

[56,] "2.95468626855699" "11" "Female"

[57,] "5.21806397606675" "7" "Female"

[58,] "7.32667279626596" "14" "Male"

[59,] "5.29593913226969" "16" "Male"

[60,] "3.93157876610918" "16" "Male"

[61,] "4.04533230252576" "13" "Male"

[62,] "7.33226094621461" "8" "Male"

[63,] "5.31272104456544" "13" "Female"

[64,] "3.45961927489878" "8" "Male"

[65,] "12.9168418119396" "14" "Female"

[66,] "6.30724899837788" "12" "Male"

[67,] "8.3037475389628" "15" "Male"

[68,] "12.699248572952" "11" "Male"

[69,] "6.34565746056291" "7" "Male"

[70,] "4.66559948040565" "7" "Male"

[71,] "9.37651841774371" "10" "Female"

[72,] "4.44543881901179" "16" "Female"

[73,] "1.99066224692378" "15" "Male"

[74,] "3.83226588964058" "8" "Female"

[75,] "0.415579118333275" "15" "Male"

[76,] "6.76214106497885" "11" "Female"

[77,] "7.23161858302899" "12" "Female"

[78,] "2.84001896917289" "9" "Female"

[79,] "3.17567587400288" "7" "Male"

[80,] "2.23230994516362" "15" "Male"

[81,] "3.79462922865248" "8" "Male"

[82,] "5.13369027999642" "15" "Female"

[83,] "1.57906105109359" "13" "Male"

[84,] "7.37036727520844" "16" "Male"

[85,] "3.08417398755917" "16" "Male"

[86,] "5.44004886193206" "13" "Female"

[87,] "7.67224872037787" "15" "Female"

[88,] "1.28424868499467" "9" "Female"

[89,] "6.31924010797694" "10" "Female"

[90,] "2.87535000181315" "10" "Female"

[91,] "7.62469000310452" "8" "Female"

[92,] "0.838097561160877" "16" "Female"

[93,] "1.78424312429109" "9" "Male"

[94,] "3.98102206396639" "7" "Male"

[95,] "1.67529349138971" "10" "Female"

[96,] "4.5829476031872" "10" "Male"

[97,] "5.43010500215299" "11" "Male"

[98,] "4.05422094130453" "9" "Female"

[99,] "6.50856879864885" "10" "Male"

[100,] "4.05527698738867" "13" "Female"

> CT1

income yrsofedu

[1,] 9.3464515 10

[2,] 1.9366329 12

[3,] 3.3846319 8

[4,] 2.3402230 16

[5,] 6.4796028 14

[6,] 5.7375599 7

[7,] 7.1765561 13

[8,] 2.4322488 10

[9,] 2.9397666 13

[10,] 1.0496517 12

[11,] 4.5131613 16

[12,] 2.9573143 11

[13,] 10.2303547 7

[14,] 1.2850215 14

[15,] 2.6585879 9

[16,] 2.6974576 10

[17,] 7.0747771 8

[18,] 8.3799971 15

[19,] 5.5415519 15

[20,] 13.7201670 15

[21,] 3.1697045 12

[22,] 5.0648588 7

[23,] 1.1206756 15

[24,] 3.7082385 10

[25,] 1.7795852 11

[26,] 8.6326834 7

[27,] 0.2516351 14

[28,] 2.7160106 7

[29,] 4.9070031 11

[30,] 3.4327225 13

[31,] 2.1996744 10

[32,] 7.3096985 9

[33,] 1.4683513 9

[34,] 3.0449554 14

[35,] 3.8919503 7

[36,] 2.4306974 16

[37,] 3.2427380 13

[38,] 5.7204148 8

[39,] 6.0859287 15

[40,] 8.8930731 8

[41,] 4.8313689 10

[42,] 9.7843409 9

[43,] 2.5442085 12

[44,] 6.2848462 11

[45,] 4.5484647 10

[46,] 2.4077513 11

[47,] 0.9542498 11

[48,] 2.4510343 11

[49,] 4.2691726 13

> CT2

income yrsofedu

[1,] 7.0035485 15

[2,] 1.3828123 14

[3,] 2.3402230 16

[4,] 6.4796028 14

[5,] 4.1645296 16

[6,] 5.7353918 15

[7,] 1.6493457 16

[8,] 7.1765561 13

[9,] 5.7923987 15

[10,] 2.1518844 16

[11,] 2.9397666 13

[12,] 4.5131613 16

[13,] 3.9260196 13

[14,] 1.2850215 14

[15,] 5.1703075 16

[16,] 2.0754916 13

[17,] 8.3799971 15

[18,] 5.5415519 15

[19,] 13.7201670 15

[20,] 4.5620976 14

[21,] 1.1206756 15

[22,] 0.2516351 14

[23,] 7.7537295 13

[24,] 7.6716766 16

[25,] 3.4327225 13

[26,] 7.5733544 15

[27,] 3.0449554 14

[28,] 2.4234319 13

[29,] 2.4306974 16

[30,] 3.2427380 13

[31,] 6.0859287 15

[32,] 4.5246223 14

[33,] 5.6645043 16

[34,] 2.0305389 13

[35,] 3.6383256 16

[36,] 5.7695153 13

[37,] 2.3203144 16

[38,] 2.9541997 16

[39,] 5.1784873 13

[40,] 4.2691726 13

> colMeans(CT)

income yrsofedu

4.465106 11.700000

> colMeans(CT1)

income yrsofedu

4.469954 11.204082

**# Exercise 4**

x1 <- rnorm(100,2,4)

x2 <- rchisq(length(x1),3)

e <- rnorm(length(x1),0,4)

Y <- 4 + 3\*x1 + 2\*x2 + e

X <- cbind(1,x1,x2)

b\_hat <- solve(t(X)%\*%X)%\*%t(X)%\*%Y

b\_hat

lm(Y~x1+x2)

> b\_hat

[,1]

3.208013

x1 3.055983

x2 1.957342

> lm(Y~x1+x2)

Call:

lm(formula = Y ~ x1 + x2)

Coefficients:

(Intercept) x1 x2

3.208 3.056 1.957