DAY ONE

YOU ARE THE AUTHOR

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# MATRIX

## Matrix Creation

A = matrix(c(5,6,2,8,9,2,4,5,1),ncol = 3, nrow = 3, byrow = T)  
A

[,1] [,2] [,3]  
[1,] 5 6 2  
[2,] 8 9 2  
[3,] 4 5 1

## Getting the determinant of a matrix

det(A)

[1] 3

## Inverse

solve(A)

[,1] [,2] [,3]  
[1,] -0.3333333 1.3333333 -2  
[2,] 0.0000000 -1.0000000 2  
[3,] 1.3333333 -0.3333333 -1

## Matrix Operation

B <- matrix(c(3,4,6,2,3,4,5,2,5), ncol = 3, nrow = 3, byrow = T)  
C <- matrix(c(8,5,3,2,3,5,9,3,3), ncol = 3, nrow = 3, byrow = T)

## View the matrix

B

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

C

[,1] [,2] [,3]  
[1,] 8 5 3  
[2,] 2 3 5  
[3,] 9 3 3

## Matrix Addition

B+C

[,1] [,2] [,3]  
[1,] 11 9 9  
[2,] 4 6 9  
[3,] 14 5 8

## Matrix Subtraction

B-C

[,1] [,2] [,3]  
[1,] -5 -1 3  
[2,] 0 0 -1  
[3,] -4 -1 2

## Matrix Division

B/C

[,1] [,2] [,3]  
[1,] 0.3750000 0.8000000 2.000000  
[2,] 1.0000000 1.0000000 0.800000  
[3,] 0.5555556 0.6666667 1.666667

## Matrix Multiplication

B\*C

[,1] [,2] [,3]  
[1,] 24 20 18  
[2,] 4 9 20  
[3,] 45 6 15

B%\*%C

[,1] [,2] [,3]  
[1,] 86 45 47  
[2,] 58 31 33  
[3,] 89 46 40

## Getting the Identity Matrix

zapsmall(solve(A)%\*%A)

[,1] [,2] [,3]  
[1,] 1 0 0  
[2,] 0 1 0  
[3,] 0 0 1

# Mathematical Operations

## Addition

y = 45+65  
y

[1] 110

## Subtraction

x = 563-546  
x

[1] 17

## Division

m = 563/87  
m

[1] 6.471264

## Multiplication

t = 56\*56  
t

[1] 3136

## Squares and Square roots

sqrt(81)

[1] 9

sqrt(225)

[1] 15

225^0.5

[1] 15

5^2

[1] 25

## Exponentials and Logarithmic

log10(100)

[1] 2

## To be checked!!!!!!

exp(2)

[1] 7.389056

# Data Importation (Comma Seperated Values, csv)

data <- read.csv("Gapminder.csv")  
head(data,5)

country year population continent life\_exp gdp\_cap ln\_population  
1 Afghanistan 1952 8425333 Asia 28.801 779.4453 6.925587  
2 Afghanistan 1957 9240934 Asia 30.332 820.8530 6.965716  
3 Afghanistan 1962 10267083 Asia 31.997 853.1007 7.011447  
4 Afghanistan 1967 11537966 Asia 34.020 836.1971 7.062129  
5 Afghanistan 1972 13079460 Asia 36.088 739.9811 7.116590  
 ln\_life\_exp ln\_gdpPercap  
1 1.459408 6.658583  
2 1.481901 6.710344  
3 1.505109 6.748878  
4 1.531734 6.728864  
5 1.557363 6.606625

tail(data,5)

country year population continent life\_exp gdp\_cap ln\_population  
1700 Zimbabwe 1987 9216418 Africa 62.351 706.1573 6.964562  
1701 Zimbabwe 1992 10704340 Africa 60.377 693.4208 7.029560  
1702 Zimbabwe 1997 11404948 Africa 46.809 792.4500 7.057093  
1703 Zimbabwe 2002 11926563 Africa 39.989 672.0386 7.076515  
1704 Zimbabwe 2007 12311143 Africa 43.487 469.7093 7.090298  
 ln\_life\_exp ln\_gdpPercap  
1700 1.794843 6.559838  
1701 1.780872 6.541637  
1702 1.670329 6.675129  
1703 1.601941 6.510316  
1704 1.638359 6.152114

## Check the structure of the data

str(data)

'data.frame': 1704 obs. of 9 variables:  
 $ country : chr "Afghanistan" "Afghanistan" "Afghanistan" "Afghanistan" ...  
 $ year : int 1952 1957 1962 1967 1972 1977 1982 1987 1992 1997 ...  
 $ population : int 8425333 9240934 10267083 11537966 13079460 14880372 12881816 13867957 16317921 22227415 ...  
 $ continent : chr "Asia" "Asia" "Asia" "Asia" ...  
 $ life\_exp : num 28.8 30.3 32 34 36.1 ...  
 $ gdp\_cap : num 779 821 853 836 740 ...  
 $ ln\_population: num 6.93 6.97 7.01 7.06 7.12 ...  
 $ ln\_life\_exp : num 1.46 1.48 1.51 1.53 1.56 ...  
 $ ln\_gdpPercap : num 6.66 6.71 6.75 6.73 6.61 ...

## Manual Data Entry

age <- c(45,65,34,32,23,25,56,76,45,22,21,45,34,56,54)  
age

[1] 45 65 34 32 23 25 56 76 45 22 21 45 34 56 54

height <- c(122,134,144,165,155,133,123,132,145,154,166,134,121,154,165)  
height

[1] 122 134 144 165 155 133 123 132 145 154 166 134 121 154 165

## Column Binding

height\_age <- cbind(age, height)  
height\_age

age height  
 [1,] 45 122  
 [2,] 65 134  
 [3,] 34 144  
 [4,] 32 165  
 [5,] 23 155  
 [6,] 25 133  
 [7,] 56 123  
 [8,] 76 132  
 [9,] 45 145  
[10,] 22 154  
[11,] 21 166  
[12,] 45 134  
[13,] 34 121  
[14,] 56 154  
[15,] 54 165

## Data Framing

mydata <- data.frame(age, height)  
head(mydata,5)

age height  
1 45 122  
2 65 134  
3 34 144  
4 32 165  
5 23 155

## Descriptive Statistics

library(stargazer)  
library(gtsummary)  
stargazer(data[,-2], type = "text")

========================================================================  
Statistic N Mean St. Dev. Min Max   
------------------------------------------------------------------------  
population 1,704 29,601,212.000 106,157,897.000 60,011 1,318,683,096  
life\_exp 1,704 59.474 12.917 23.599 82.603   
gdp\_cap 1,704 7,215.327 9,857.455 241.166 113,523.100   
ln\_population 1,704 6.847 0.697 4.778 9.120   
ln\_life\_exp 1,704 1.763 0.101 1.373 1.917   
ln\_gdpPercap 1,704 8.159 1.241 5.485 11.640   
------------------------------------------------------------------------

## Additional Way of Displaying Summary Statistics.

### Load the libraries  
library(ggplot2)  
library(devtools)  
library(predict3d)  
library(psych)  
library(dplyr)  
library(gtsummary)  
library(DescTools)  
library(nortest)   
library(lmtest)  
library(sandwich)

## Display the Summary Statistics

knitr::kable(  
 describeBy(data[,-1]) %>% round(2)   
)

|  | vars | n | mean | sd | median | trimmed | mad | min | max | range | skew | kurtosis | se |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| year | 1 | 1704 | 1979.50 | 17.27 | 1979.50 | 1979.50 | 22.24 | 1952.00 | 2.007000e+03 | 5.500000e+01 | 0.00 | -1.22 | 0.42 |
| population | 2 | 1704 | 29601212.32 | 106157896.74 | 7023595.50 | 11399459.45 | 7841473.62 | 60011.00 | 1.318683e+09 | 1.318623e+09 | 8.33 | 77.62 | 2571683.45 |
| continent\* | 3 | 1704 | 2.33 | 1.21 | 2.00 | 2.27 | 1.48 | 1.00 | 5.000000e+00 | 4.000000e+00 | 0.25 | -1.34 | 0.03 |
| life\_exp | 4 | 1704 | 59.47 | 12.92 | 60.71 | 59.92 | 16.10 | 23.60 | 8.260000e+01 | 5.900000e+01 | -0.25 | -1.13 | 0.31 |
| gdp\_cap | 5 | 1704 | 7215.33 | 9857.45 | 3531.85 | 5221.44 | 4007.61 | 241.17 | 1.135231e+05 | 1.132820e+05 | 3.84 | 27.40 | 238.80 |
| ln\_population | 6 | 1704 | 6.85 | 0.70 | 6.85 | 6.85 | 0.62 | 4.78 | 9.120000e+00 | 4.340000e+00 | 0.08 | 0.47 | 0.02 |
| ln\_life\_exp | 7 | 1704 | 1.76 | 0.10 | 1.78 | 1.77 | 0.11 | 1.37 | 1.920000e+00 | 5.400000e-01 | -0.57 | -0.66 | 0.00 |
| ln\_gdpPercap | 8 | 1704 | 8.16 | 1.24 | 8.17 | 8.14 | 1.51 | 5.49 | 1.164000e+01 | 6.150000e+00 | 0.11 | -0.95 | 0.03 |