First steps in R. Variables, summary, folders, data sets

 # Vectors and simple operations

```
> x <- c(1,3,5,6)
```
 # Create a vector (c means concatenate)

```
> x = c(1,3,5,6)
```
 # Another way to define a vector

```
> x
[1] 1 3 5 6
```

```
> x[2]
[1] 3
```
 # Get the 2nd element of vector x

```
> x[2:4]
[1] 3 5 6
```
 # Get all elements of x from the 2nd to the 4th

```
> x = rnorm(10000,2,100)
```
 # Generate a vector of 10,000 Normal random variables
 # with mean 2 and st. deviation 100

 # Basic statistics

```
> mean(x)
[1] 2.379067
> sd(x)
[1] 100.0676
```

 # Arithmetic operations

```
> x = c(1,3,5,7,0,-1)
> x
[1]  1  3  5  7  0 -1
> x^2
[1]  1  9 25 49  0  1
> sin(x)
[1]  0.8414710  0.1411200 -0.9589243  0.6569866  0.0000000  -0.8414710
> log(x)
[1] 0.000000 1.098612 1.609438 1.945910     -Inf      NaN
Warning message:
In log(x) : NaNs produced
```

 # Define a matrix A based on a vector x

```
> A = matrix(x,2,3)
> A
     [,1] [,2] [,3]
[1,]    1    5    0
[2,]    3    7   -1
```

 # READING DATA FROM EXTERNAL FILES

 # To point to the right folder, go "File" -> "Change dir..." or use the setwd command
 # Which folder is R pointed to right now?

```
> getwd()
[1] "C:/Users/baron/Documents"
```

 # Let's change the folder to the one where we have data. Notice slashes.

```
> setwd("C:/Users/baron/Advanced Biostatistics/data")
```

 # Use read.csv("file.csv") to read CSV viles, read.table("file.txt") to read text files
 # Rda and Rdata files should be opened with load("file.rda")

```
> load("Heart.rda")
```

 # Or, load data from a public domain

```
>  Heart = read.csv("http://fs2.american.edu/baron/www/622/R/Heart.csv")
```

 # Find out what variables are in the set

```
> dim(Heart)
[1] 303  15

> names (Heart)
[1] "X"          "Age"        "Sex"        "ChestPain" "RestBP"     "Chol"
 [7] "Fbs"        "RestECG"    "MaxHR"      "ExAng"     "Oldpeak"    "Slope"
[13] "Ca"         "Thal"       "AHD"

> summary (Heart)
       X                Age              Sex           ChestPain
 Min.   :  1.0   Min.   :29.00   Min.   :0.0000   Length:303
 1st Qu.: 76.5   1st Qu.:48.00   1st Qu.:0.0000   Class :character
 Median :152.0   Median :56.00   Median :1.0000   Mode  :character
 Mean   :152.0   Mean   :54.44   Mean   :0.6799
 3rd Qu.:227.5   3rd Qu.:61.00   3rd Qu.:1.0000
 Max.   :303.0   Max.   :77.00   Max.   :1.0000

     RestBP           Chol            Fbs            RestECG
 Min.   : 94.0   Min.   :126.0   Min.   :0.0000   Min.   :0.0000
 1st Qu.:120.0   1st Qu.:211.0   1st Qu.:0.0000   1st Qu.:0.0000
 Median :130.0   Median :241.0   Median :0.0000   Median :1.0000
 Mean   :131.7   Mean   :246.7   Mean   :0.1485   Mean   :0.9901
 3rd Qu.:140.0   3rd Qu.:275.0   3rd Qu.:0.0000   3rd Qu.:2.0000
 Max.   :200.0   Max.   :564.0   Max.   :1.0000   Max.   :2.0000

     MaxHR           ExAng          Oldpeak         Slope             Ca
 Min.   : 71.0   Min.   :0.0000   Min.   :0.00   Min.   :1.000   Min.   :0.0000
 1st Qu.:133.5   1st Qu.:0.0000   1st Qu.:0.00   1st Qu.:1.000   1st Qu.:0.0000
 Median :153.0   Median :0.0000   Median :0.80   Median :2.000   Median :0.0000
 Mean   :149.6   Mean   :0.3267   Mean   :1.04   Mean   :1.601   Mean   :0.6722
 3rd Qu.:166.0   3rd Qu.:1.0000   3rd Qu.:1.60   3rd Qu.:2.000   3rd Qu.:1.0000
 Max.   :202.0   Max.   :1.0000   Max.   :6.20   Max.   :3.000   Max.   :3.0000
                                                                 NA's   :4
     Thal              AHD
 Length:303         Length:303
```

```
 Class :character   Class :character
 Mode  :character   Mode  :character
```

 # Look at the data as a spreadsheet

```
> fix(Heart)
```

 # Refer to the particular variable in this dataset with $ sign...

```
> Heart$Age
  [1] 63 67 67 37 41 56 62 57 63 53 57 56 56 44 52 57 48 54 48 49 64 58 58
     < truncated >
```

 # or attach it the dataset that you plan to work with...

```
> attach(Heart)
```

 # Descriptive statistics: mean and the 5-number summary

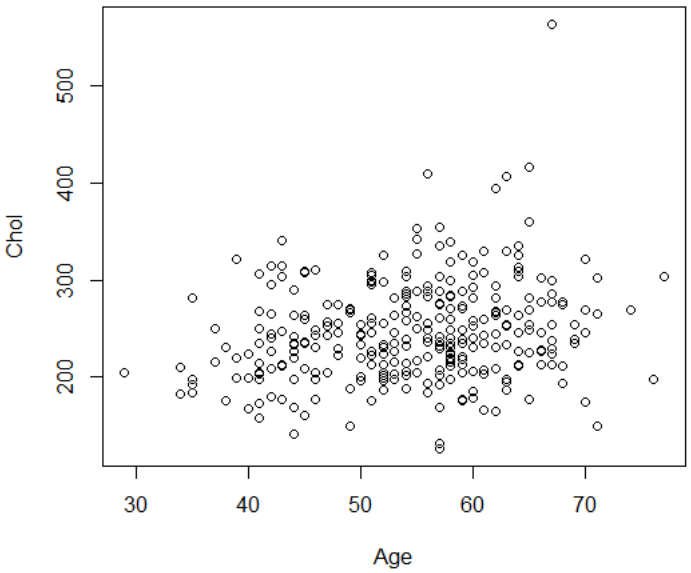
```
> mean(Heart$Chol)
[1] 246.6931

> summary(Chol)
   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  126.0   211.0   241.0   246.7   275.0   564.0
```

 # PLOTS.

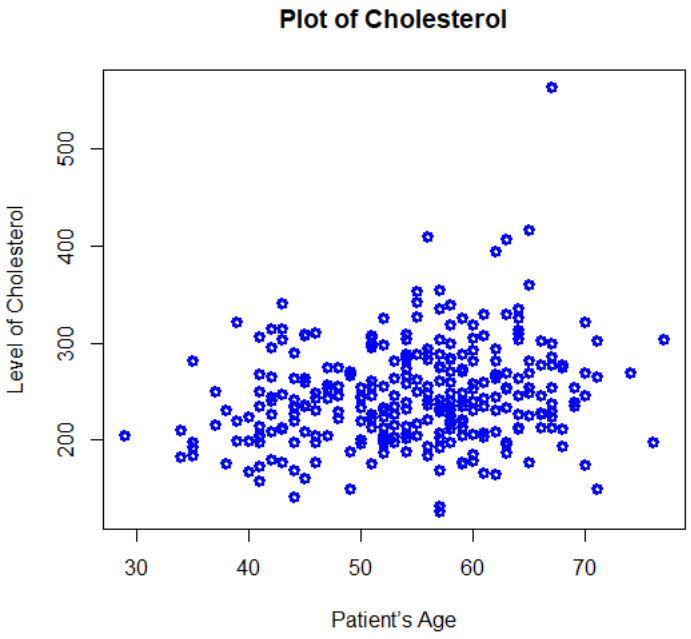
 # Before you do anything with the data, look at them.

```
> plot(Age,Chol)
```



 # Axis labels, graph title, color

```
> plot(Age, Chol, xlab="Patient's Age", ylab="Level of Cholesterol",
main="Plot of Cholesterol", col="blue", lwd=3)
```

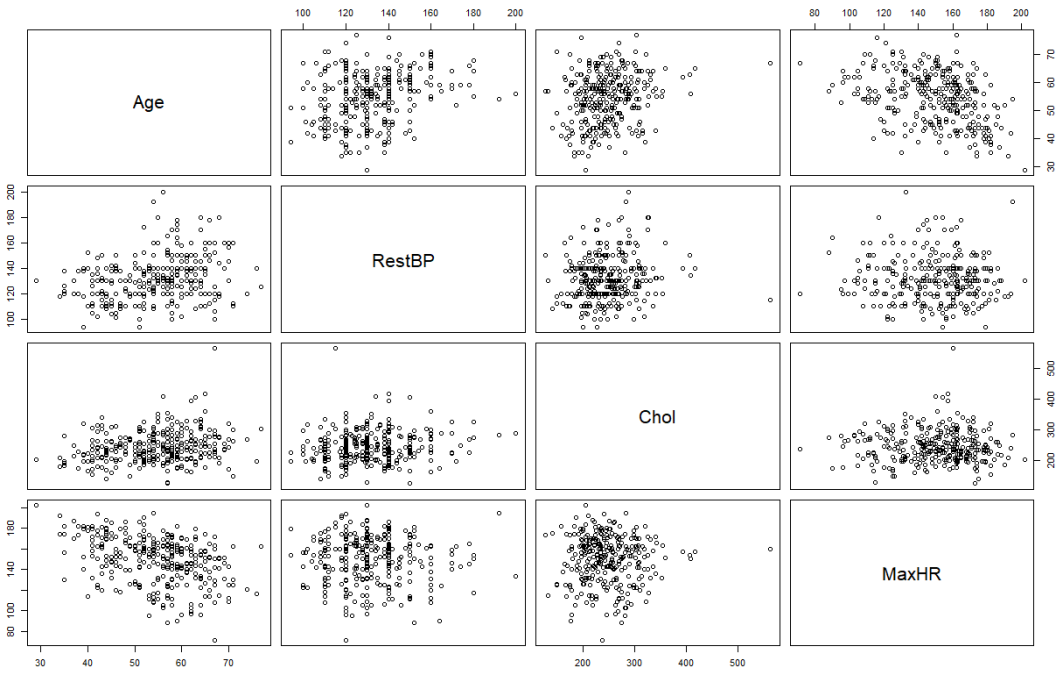


 # SCATTERPLOT MATRIX #
 # Use it to plot more than 2 variables.
 # First, partition the graphing window into a matrix

```
> par(mfrow=c(4,4))
```

 # Then fill each non-diagonal space with the corresponding scatterplot

```
> pairs(~Age+RestBP+Chol+MaxHR)
```



 # Saving a graph in a file

```
> pdf("filename.pdf")
> plot(Chol, RestBP, col="blue")

> dev.off()
windows
      2
```

 # Finish and quit R

```
> q()
```