# A Quick Introduction to using R for Data Analysis

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## Contents



## 1 Basic R Objects and Operations

```
# create a vector
x <- 1:10
x <- seq (30,3, by = -2)
a <- c(66.32, 69.87, 70.12, 90.37, 50.08, 61.20, 65.00, 57.65)
d <- a [1]
a [1] <- 85.34

mean (a)
```

```
## [1] 68.70375
```

```
ma <- mean (a)
# read a vector of numbers from a file
x <- scan("numbers.txt")
x2 <- scan("number2.txt")

# one can also read number withoug saving to a file
y <- scan(text = "7  8  9 10 11 12 13 13 14 17 17 45")

# create a matrix
A <- matrix (0, 4, 2)

A <- matrix (1:8, 4,2)

A
```

```
##      [,1] [,2]
## [1,]    1    5
## [2,]    2    6
## [3,]    3    7
## [4,]    4    8
```

```r
D <- matrix (a, 4, 2, byrow=T)

D <- matrix(1:8, 2, 4)
D
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    3    5    7
## [2,]    2    4    6    8
```

```r
# create another matrix with all entry 0
B <- matrix (1:5000, 100, 50)

# assign a number to B
B[2,4] <- 45
B[1,]
```

```
##  [1]    1  101  201  301  401  501  601  701  801  901 1001 1101 1201 1301 1401
## [16] 1501 1601 1701 1801 1901 2001 2101 2201 2301 2401 2501 2601 2701 2801 2901
## [31] 3001 3101 3201 3301 3401 3501 3601 3701 3801 3901 4001 4101 4201 4301 4401
## [46] 4501 4601 4701 4801 4901
```

```r
B[,1]
```

```
##   [1]   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18
##  [19]  19  20  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36
##  [37]  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54
##  [55]  55  56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72
##  [73]  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90
##  [91]  91  92  93  94  95  96  97  98  99 100
```

```r
B[1,] <- 1:50


# create a list
E <- list (newa = a, newA = A)
# list the names of components
names (E)
```

```
## [1] "newa" "newA"
```

```r
# to look at the component of E
E$newA
```

```
##      [,1] [,2]
## [1,]    1    5
## [2,]    2    6
## [3,]    3    7
## [4,]    4    8
```

```r
E$newa <- 10:17

# create a dataframe
scores <- c (30, 45, 50)
names <- c("Peter", "John", "Alice")
stat245_scores <- data.frame (names, scores)
stat245_scores
```

```
##   names scores
```

```
## 1 Peter     30
## 2  John     45
## 3 Alice     50
```

```
stat245_scores$names
```

```
## [1] "Peter" "John"  "Alice"
```

```
stat245_scores$scores [1] <- 40
stat245_scores
```

```
##   names scores
## 1 Peter     40
## 2  John     45
## 3 Alice     50
```

```
stat245_scores$perc <- stat245_scores$scores/50 * 100
stat245_scores
```

```
##   names scores perc
## 1 Peter     40   80
## 2  John     45   90
## 3 Alice     50  100
```

```
stat245_scores$adj <- stat245_scores$perc + 10
stat245_scores
```

```
##   names scores perc adj
## 1 Peter     40   80  90
## 2  John     45   90 100
## 3 Alice     50  100 110
```

```
################################################################################
```

## 2 Import a dataset into R environment and Simple Operation

```
################################################################################

# import myagpop.csv into an R data frame called 'myagpop'
agpop <- read.csv("agpop.csv")

# Now, we can use the data:

# preview agpop
head (agpop)
```

```
##                 county state acres92 acres87 acres82 farms92 farms87 farms82
## 1 ALEUTIAN ISLANDS AREA    AK  683533  726596  764514      26      27      28
## 2        ANCHORAGE AREA    AK   47146   59297  256709     217     245     223
## 3        FAIRBANKS AREA    AK  141338  154913  204568     168     175     170
## 4           JUNEAU AREA    AK     210     214     127       8       8      12
## 5  KENAI PENINSULA AREA    AK   50810   85712   98035      93     119     137
## 6        AUTAUGA COUNTY    AL  107259  116050  145044     322     388     453
##   largef92 largef87 largef82 smallf92 smallf87 smallf82 region
## 1       14       16       20        6        4        1      W
## 2        9       10       11       41       52       38      W
## 3       25       28       21       12       18       25      W
```

```
## 4        0        0        0        5        4        8      W
## 5        9       18       17       12       18       19      W
## 6       25       32       32        8       19       17      S
```

```
# look at the variable name
colnames (agpop)
```

```
##  [1] "county"   "state"    "acres92"  "acres87"  "acres82"  "farms92"
##  [7] "farms87"  "farms82"  "largef92" "largef87" "largef82" "smallf92"
## [13] "smallf87" "smallf82" "region"
```

```
# find number of cols
ncol (agpop)
```

```
## [1] 15
```

```
# find number of rows
nrow (agpop)
```

```
## [1] 3078
```

```
# access a certain row
agpop [2, ]
```

```
##           county state acres92 acres87 acres82 farms92 farms87 farms82 largef92
## 2 ANCHORAGE AREA    AK   47146   59297  256709     217     245     223        9
##   largef87 largef82 smallf92 smallf87 smallf82 region
## 2       10       11       41       52       38      W
```

```
# access a certain column
agpop [1:20, "acres92"] ## equivalent to
```

```
##  [1] 683533  47146 141338    210  50810 107259 167832 177189  48022 137426
## [11] 144799  96427  73841 109555 121504  99466  67950  61426  68478  47200
```

```
agpop$acres92[1:20]
```

```
##  [1] 683533  47146 141338    210  50810 107259 167832 177189  48022 137426
## [11] 144799  96427  73841 109555 121504  99466  67950  61426  68478  47200
```

```
agpop$largef92[1:20]
```

```
##  [1] 14  9 25  0  9 25 24 40  6  9 29 18  4 22 24  8  9 13  4  5
```

```
# find mean of acres92
mean (agpop $acres92)
```

```
## [1] 306677
```

```
# find sd of acres92
sd (agpop $acres92)
```

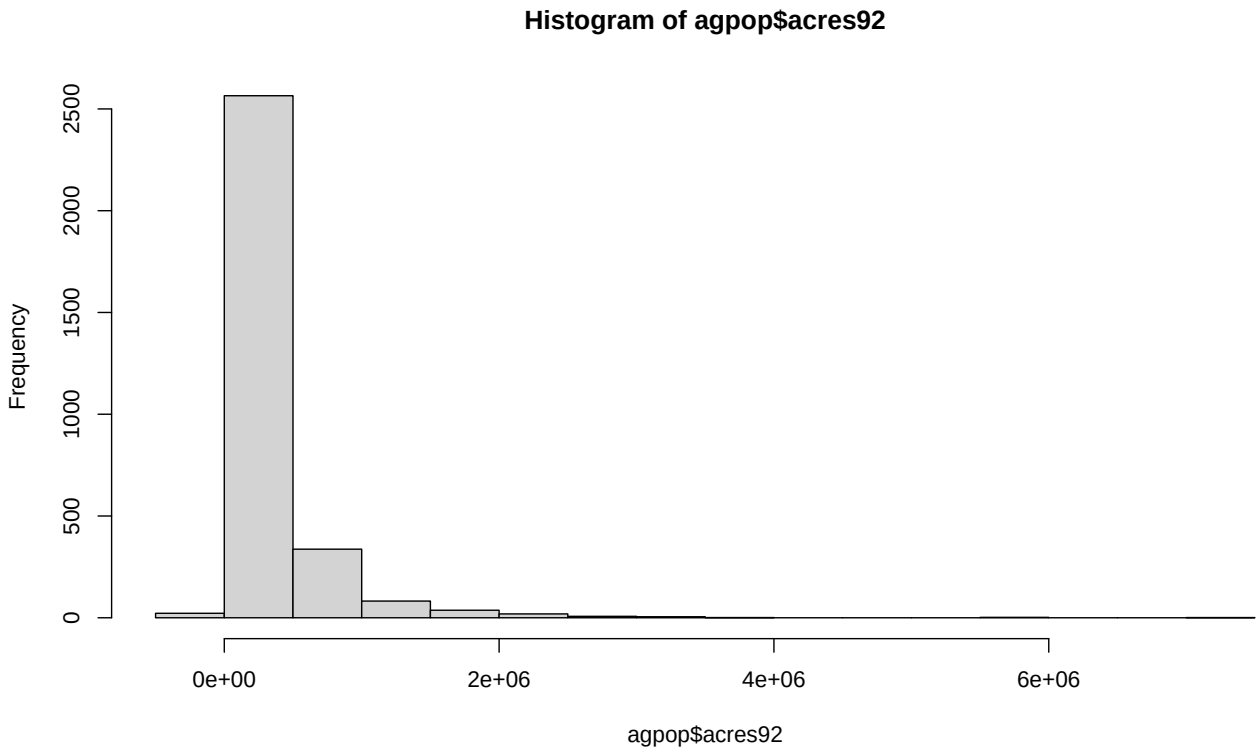
```
## [1] 424686.7
```

```
agpop_AK  <- agpop [agpop$state == "AK", ]

agpop_AK <- subset (agpop, state == "AK")

agpop_W <- subset (agpop, region == "W")

agpop_largefarm <- subset (agpop, largef92 > 10)
```

```
## simple analysis
summary (agpop)
```

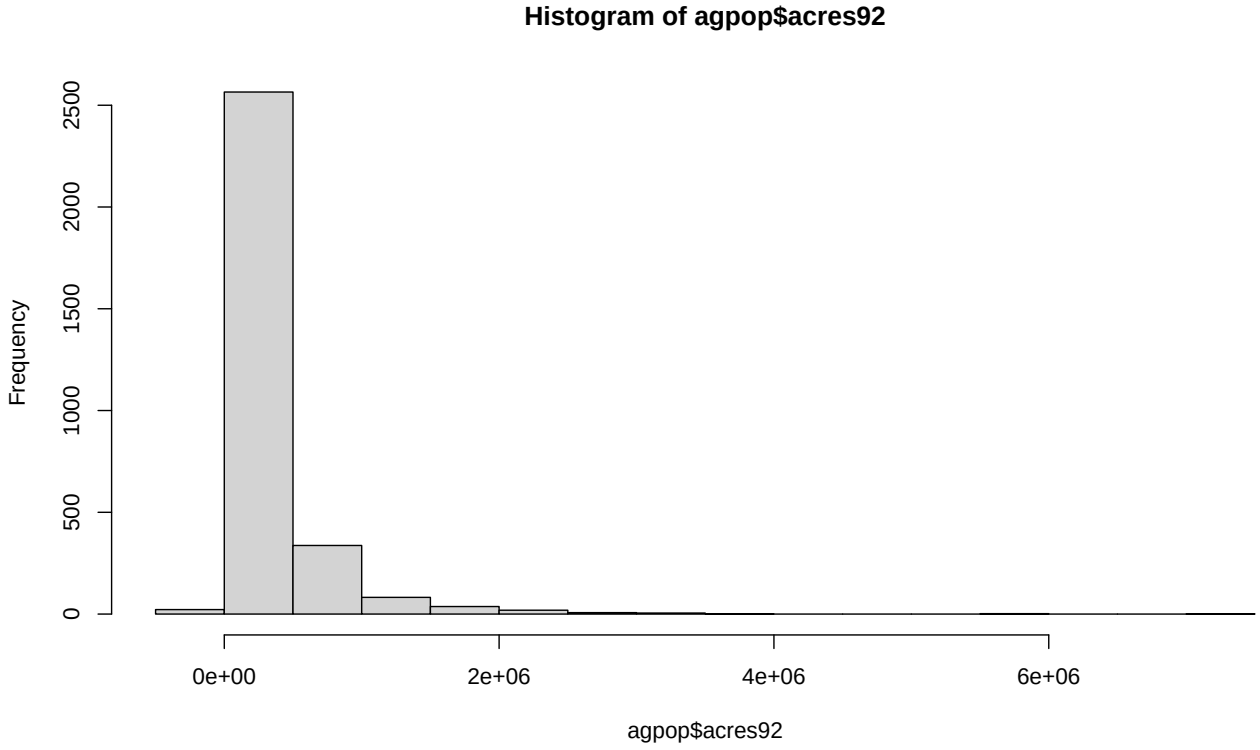
```
##     county              state               acres92           acres87
##  Length:3078        Length:3078        Min.   :    -99   Min.   :    -99
##  Class :character   Class :character   1st Qu.:  80903   1st Qu.:  86236
##  Mode  :character   Mode  :character   Median : 191648   Median : 199864
##                                        Mean   : 306677   Mean   : 313016
##                                        3rd Qu.: 366886   3rd Qu.: 372224
##                                        Max.   :7229585   Max.   :7687460
##     acres82           farms92          farms87          farms82
##  Min.   :    -99   Min.   :   0.0   Min.   :   0.0   Min.   :   0.0
##  1st Qu.:  96397   1st Qu.: 295.0   1st Qu.: 318.5   1st Qu.: 345.0
##  Median : 207292   Median : 521.0   Median : 572.0   Median : 616.0
##  Mean   : 320194   Mean   : 625.5   Mean   : 678.3   Mean   : 728.1
##  3rd Qu.: 377065   3rd Qu.: 838.0   3rd Qu.: 921.0   3rd Qu.: 991.0
##  Max.   :7313958   Max.   :7021.0   Max.   :7590.0   Max.   :7394.0
##     largef92         largef87         largef82         smallf92
##  Min.   :  0.00   Min.   :  0.00   Min.   :  0.00   Min.   :   0.00
##  1st Qu.:  8.00   1st Qu.:  8.00   1st Qu.:  8.00   1st Qu.:  13.00
##  Median : 30.00   Median : 27.00   Median : 25.00   Median :  29.00
##  Mean   : 56.18   Mean   : 54.86   Mean   : 52.62   Mean   :  54.09
##  3rd Qu.: 75.00   3rd Qu.: 70.00   3rd Qu.: 65.00   3rd Qu.:  59.00
##  Max.   :579.00   Max.   :596.00   Max.   :546.00   Max.   :4298.00
##     smallf87         smallf82          region
##  Min.   :   0.00   Min.   :   0.00   Length:3078
##  1st Qu.:  17.00   1st Qu.:  16.00   Class :character
##  Median :  35.00   Median :  34.00   Mode  :character
##  Mean   :  59.54   Mean   :  60.97
##  3rd Qu.:  67.00   3rd Qu.:  67.00
##  Max.   :3654.00   Max.   :3522.00
```

```
hist (agpop$acres92)
```



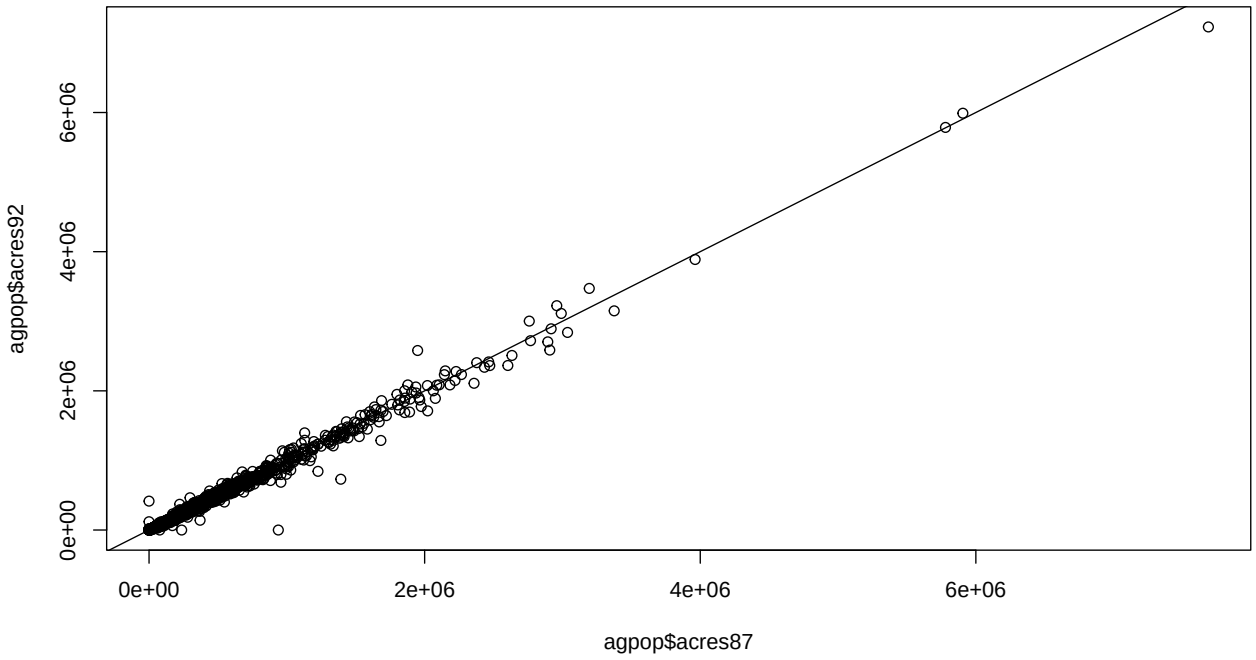

Produce Plots

```
#pdf ("hist_acres92.pdf") ## use this command and dev.off to save the output to a file
hist (agpop$acres92)
```




```
#dev.off()
```

```
#jpeg ("agpop_acres_87v92.jpg")

plot (agpop$acres87, agpop$acres92)
abline (a = 0, b = 1)
```




```
#dev.off()## this is used to close the jpeg file
```

# 3 Create your own function

```
## data is a matrix or data.frame
means_col <- function (data)
{
    n <- ncol (data)
    cmeans <- rep (NA, n)
    for (j in 1:n)
    {
        cmeans[j] <- mean (data[,j])

    }
    cmeans
}

## apply function
means_col (agpop[, 3:13])
```

```
##  [1] 306676.97141 313016.37817 320193.69298    625.50357    678.28428
##  [6]    728.06238     56.17674     54.86160     52.62248     54.09227
## [11]     59.53769
```

```
## R built-in function
colMeans (agpop[, 3:13])
```

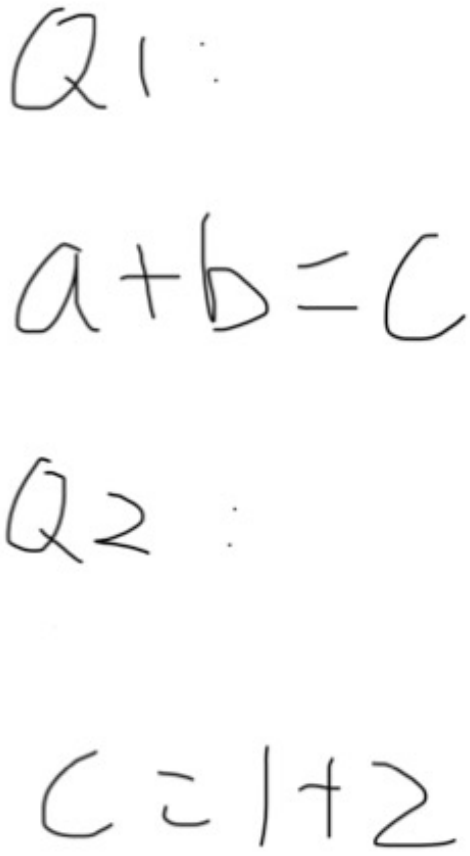
```
##      acres92      acres87      acres82      farms92      farms87      farms82
```

```
## 306676.97141 313016.37817 320193.69298    625.50357    678.28428    728.06238
##     largef92     largef87     largef82     smallf92     smallf87
##     56.17674     54.86160     52.62248     54.09227     59.53769
```

# 4 Include Images Saved in An External File

Using the following R code to include your images saved in an external file.

```
knitr::include_graphics("handwriting.png")
```




You can hide the above R code by setting "echo=FALSE" for the r chunk. For example, I will include the image once again as follows:

Q1 :

$a+b=c$

Q2 :

$c=1+2$