# Module 3 In Class Activity

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**Date:** September 16, 2018
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## PART A

1) Load the islands dataset and obtain the total number of observations.

```
rm(list=ls())
data("islands") #load the dataset islands
#help("islands")
summary(islands)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##    12.0    20.5    41.0  1253.0   183.2 16990.0
```

**Description:** The areas in thousands of square miles of the landmasses which exceed 10,000 square miles.
**Usage:** islands **Answer:** **The total number of observation is:**

2) Calculation of mean and media:

```
mean(islands)
```

```
## [1] 1252.729
```

```
median(islands)
```

```
## [1] 41
```

3) Using range calculate max and min value size of the islands: it will be display as min max in the output of the following command.

```
range(islands)
```

```
## [1]    12 16988
```

4) Standard desviation and Range.

```
sd(islands) #standard desviation
```

```
## [1] 3371.146
```

```
range(islands) #range output = (min,max)
```

```
## [1]    12 16988
```

5) Quantile Function:

a) Find the quantiles for: 0%, 25%, 50%, 75%, 100%

```
quantile(islands)
```

```
##       0%      25%      50%      75%     100%
##    12.00    20.50    41.00   183.25 16988.00
```

b) Find the quantiles for: .05%, 95%

```
quantile(islands,probs = c(0.005,0.95))
```

```
##     0.5%      95%
##   12.235 8481.750
```

c) What does the parameter na.rm do?

```
data_test <- c(0.5,10,NaN)
quantile(data_test,na.rm = TRUE)
```

```
##     0%    25%    50%    75%   100%
##  0.500  2.875  5.250  7.625 10.000
```

```
try(quantile(data_test)) #How can
try(quantile(data_test,na.rm = FALSE))
```

If the na.rm flag is set as FALSE the NaN values are not removed before the computation, therefore they are not allow to be in the data set. As may be observed above.

6) Interqueartile range: As can be observed in the calculation below it correspond to the different between the 75% quartile and the 25% queartile.

```
quantile(islands)
```

```
##       0%      25%      50%      75%     100%
##    12.00    20.50    41.00   183.25 16988.00
```

```
calculate_IQR <- (183.25-20.5)
print("Calculate IQR:")
```

```
## [1] "Calculate IQR:"
```

```
print(calculate_IQR)
```

```
## [1] 162.75
```

```
print("IQR using the command")
```

```
## [1] "IQR using the command"
```

```
IQR(islands)
```

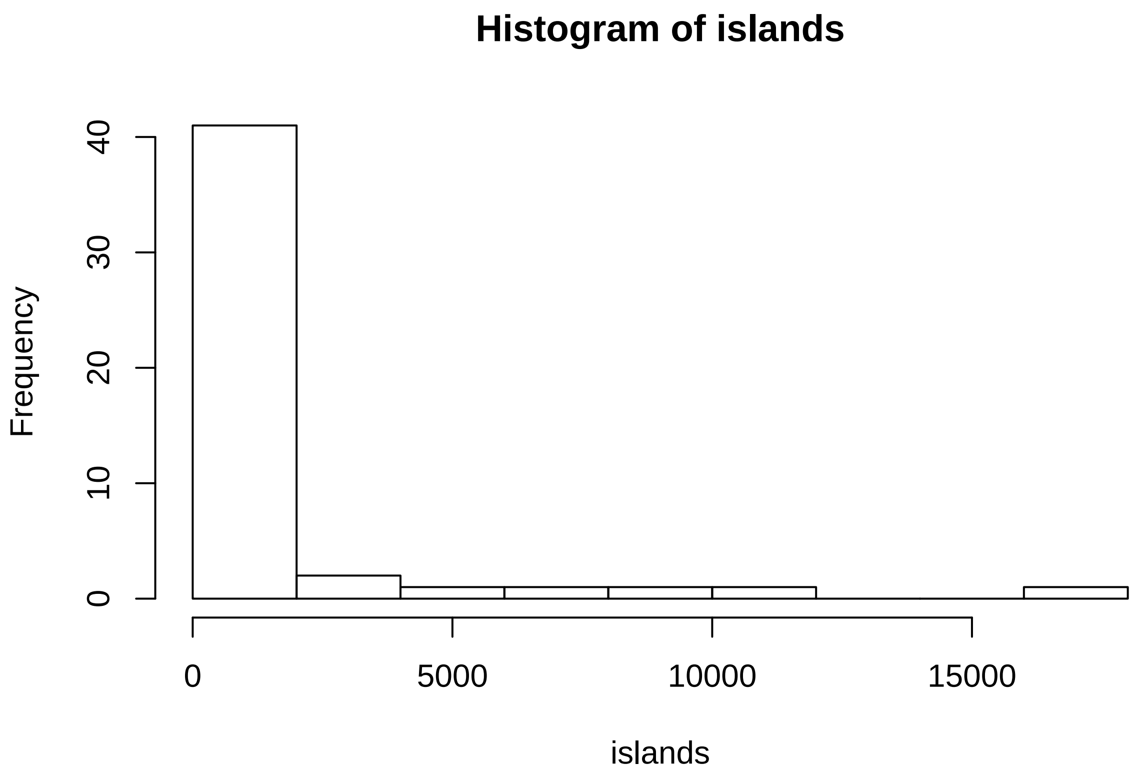
```
## [1] 162.75
```

```
#IQR(data_test,na.rm = TRUE)
```

7) Create a histogram of the data, where x = islands. The histogram will help you understand how the data is distributed: From the histogram and the probability plot it can be infered that the islans of less than 2500 square miles are more frequent while values between 2.5k and 11k are almost equially distributed.

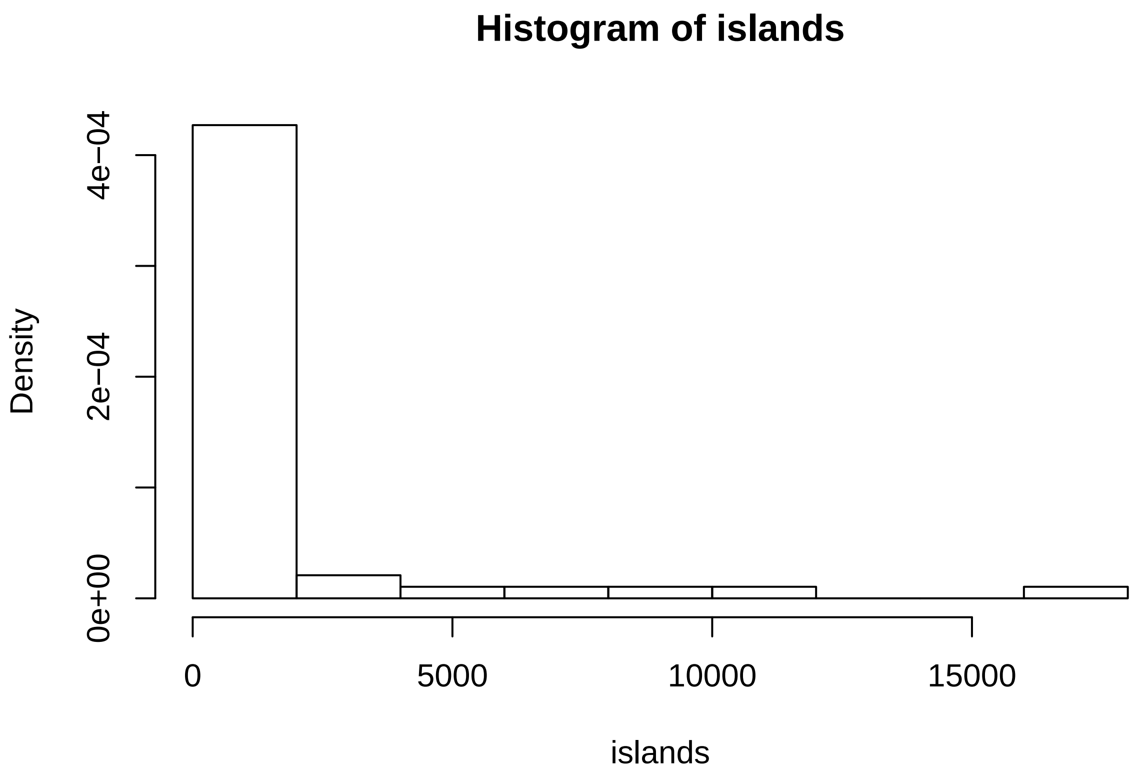
a) Using the frequency of each bin:

```
hist(islands)
```



b) Using the proportion of each bin:

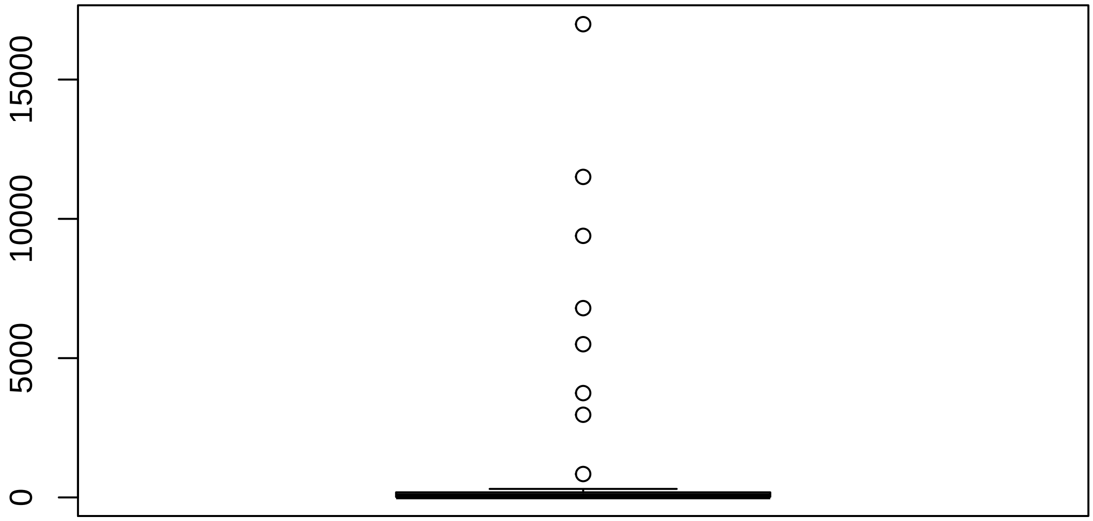
```
hist(islands,prob=TRUE)
```



8) Create box-plots. Use boxplot(x). This is another way for you to visualize how the data is distributed, and whether there are any outliers.

a) Create a boxplot using all the data in islands Definition of boxplot (extracted from wikipedia): In descriptive statistics, a box plot or boxplot is a method for graphically depicting groups of numerical data through their quartiles.

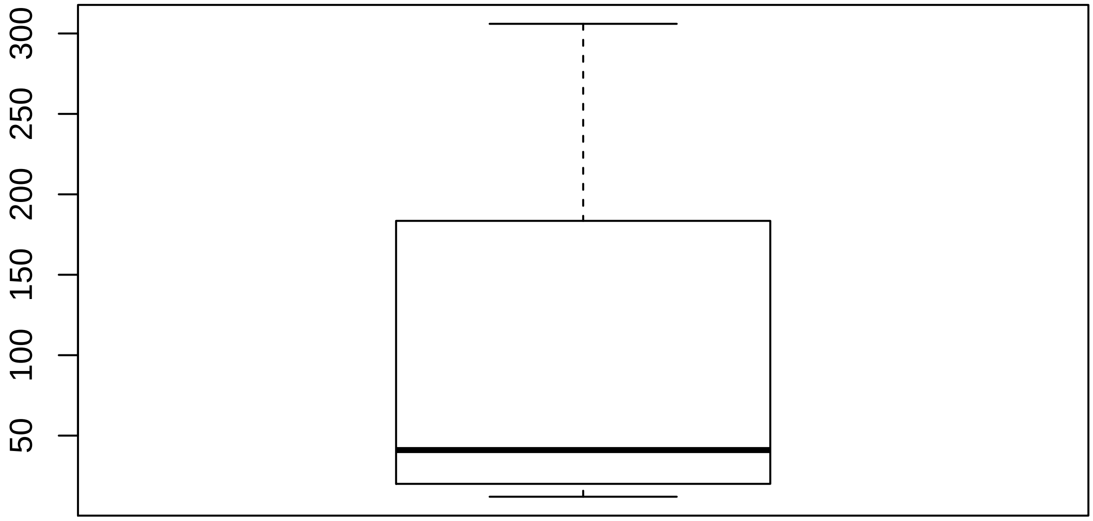
```r
boxplot(islands)
```



b) What does the parameter outline mean? In this case the values out of the usual distribution are not drawn. As may be observe in the boxplot below this allow to appreciate the distribution of the quartiles having the average in a value close to 50 (widther line). The area inside the box correspond to the IQR while the whiskers describe the other quartiles.

c) Create a boxplot without outliers

```r
boxplot(islands, outline = FALSE)
```



9) Using the function boxplot, find the outliers of islands:

```r
boxplot(islands, plot=FALSE)$out
```

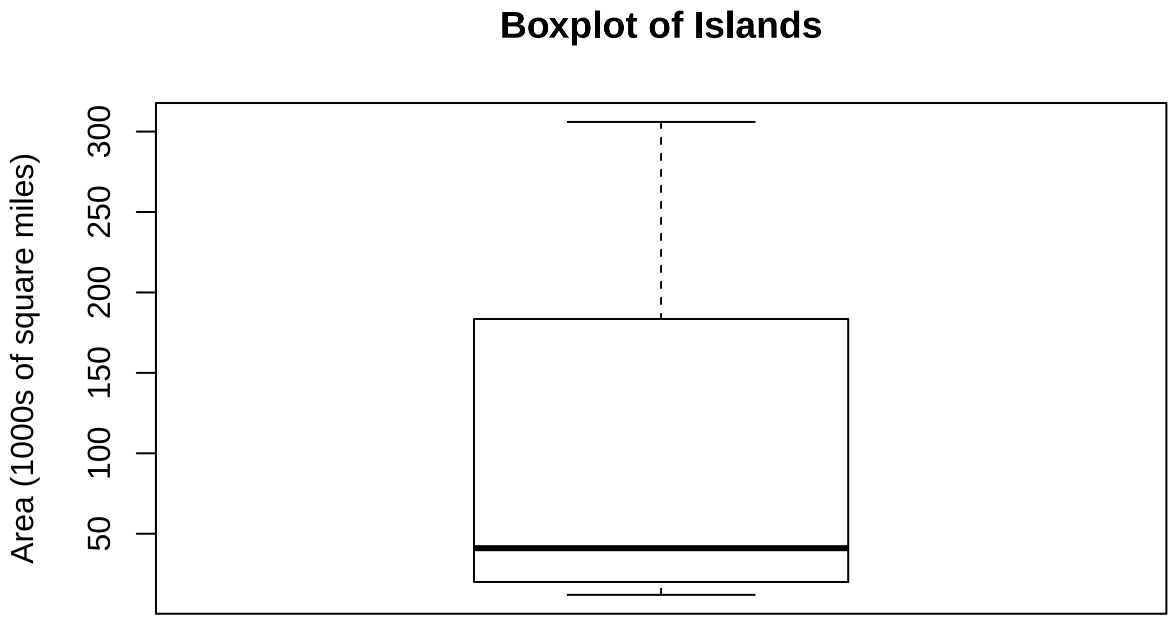
```
##        Africa    Antarctica          Asia     Australia        Europe
##         11506          5500         16988          2968          3745
##     Greenland North America South America
##           840          9390          6795
```

a) What are the outliers? Outliers are points of data, observations, that are distant from the others. They may indicade variability in the mesuarments or also they may indicate errors. R can calculate the value with the largest difference between it and sample mean with the command below.

```
#outlier(islands) #it works when I installed but not when I try to produce the doc
```

b) Give the plot you just created a title and y-axis label

```
boxplot(islands, outline = FALSE)
title(main="Boxplot of Islands",ylab = "Area (1000s of square miles)")
```



10) Create a stem and leaf plot of islands: Use stem(x) function.

a) Where is the output? The steam plot split the data using the fist number and how may time appear with other numbers.

```
stem(islands)
```

```
##
##   The decimal point is 3 digit(s) to the right of the |
##
##    0 | 00000000000000000000000000000111111222338
##    2 | 07
##    4 | 5
##    6 | 8
##    8 | 4
##   10 | 5
##   12 |
##   14 |
##   16 | 0
```

b) How would you interpret the output? Hint: The histogram you made could be helpful From this we can observed that the mayority of the data start with 0000.XX which means low values. Comparing this with the boxplot it can be observed that the majority of the population is in the bottom half.

**PART B**

1) The data is imported using the read.table() command, it is necessary to use tab as the separator. The first row correspond to the header: “Pre-test Quiz 1 Quiz 2 Midterm Quiz 3 Quiz 4 Final”

a)

```
dt2 <- read.table("data_ICA3.txt", sep="\t") #The variable dt2 represent the dataset(table)of the score
```

b) The data imported trough the read.table() command will provide a list with the data where each element in the list correspond to one column in the table:

```
mode(dt2)
```

```
## [1] "list"
```

c) How many observations are there? The number of observations correspont to the number of rows in the table for this case is 50 observations.

```
dt2
```

```
##          V1      V2      V3        V4      V5      V6     V7
## 1  Pre-test  Quiz 1  Quiz 2  Midterm   Quiz 3  Quiz 4  Final
## 2        56      49      95        64      78      72     90
## 3        58      66      82       100              79     91
## 4        63      45      61       100      83      48     87
## 5        50      44     100        92      45      69     78
## 6        58      64      81        59      64             97
## 7        61      56      57       100      75      44     87
## 8        63      58      56        80      40      56     85
## 9        67      64      79        72      76      75     90
## 10               72      62       100      80      89     89
## 11       56      50      68        68      45      62     91
## 12       64      52      78        75                    100
## 13       60      50      78        74      56      70     87
## 14               64      93        70     100      81     98
## 15       55      38      34        76     100     100    100
## 16       57      54      53                100      53     83
## 17               60      82        71      74      35     94
## 18                       71        47      69      68     88
## 19       56      53      67        99     100      57     93
## 20       61      63      80                 79      49     90
## 21       54      57      95        39      78      84     86
## 22       50      59      87        78     100      82     93
## 23               83      64       100      52             86
## 24       60      60      51        91      87      71     76
## 25       61      60      76        99      79       2     95
## 26       57      55      61        84      80      18     92
## 27               60      85        43      48      31     85
## 28       59      59      80        68      93             94
## 29               69      77        65      82      47     84
## 30       63      56      64        69      64      82     90
## 31       57      66      81        98      88      77     91
## 32       63      79      66        43      76      68     93
## 33               68      75        95     100      30     92
## 34       63      51      50        86      80     100     98
## 35       60      70      92        94      97      24     90
## 36       59      63      84        92      56      63     89
## 37                       83        89      90      81     91
## 38                       81        41      57      47    100
## 39       55      41      66        89      70      68     80
## 40       54      49      55        65      47      29     88
## 41              63     47       100   100    100    93
## 42       56     58     71        70   100     88    98
## 43       55     61     69        66    63           92
## 44              51     81        63    92           89
## 45       68     77     65       100    99     56    81
## 46       63     61     89        94    94     35    92
## 47       61     71     58        97   100     69   100
## 48       54     54     93       100   100     63    92
## 49       61     41     81        95    37     52    88
## 50                    89        80    82     87    95
## 51                    58        78    98     30    93
```

```r
#mode(dt2)
#summary(dt2)
#length(dt2[1])
```

d) How many variables are there? The number of variables correspond to the number of columns in the data. For this case it is 7 columns.

2)

a) names(x): This command names show you the labes of each column (variable) into the table.

```r
names(dt2)
```

```
## [1] "V1" "V2" "V3" "V4" "V5" "V6" "V7"
```

b) Changing the names example:

```r
print("Scores with original name")
```

```
## [1] "Scores with original name"
```

```r
names(dt2)
```

```
## [1] "V1" "V2" "V3" "V4" "V5" "V6" "V7"
```

```r
names(dt2)[1] <- "Pre-test"
names(dt2)
```

```
## [1] "Pre-test" "V2"       "V3"       "V4"       "V5"       "V6"      
## [7] "V7"
```

```r
dt2
```

```
##    Pre-test     V2     V3        V4    V5     V6    V7
## 1  Pre-test Quiz 1 Quiz 2 Midterm  Quiz 3 Quiz 4 Final
## 2        56     49     95        64    78     72    90
## 3        58     66     82       100           79    91
## 4        63     45     61       100    83     48    87
## 5        50     44    100        92    45     69    78
## 6        58     64     81        59    64           97
## 7        61     56     57       100    75     44    87
## 8        63     58     56        80    40     56    85
## 9        67     64     79        72    76     75    90
## 10              72     62       100    80     89    89
## 11       56     50     68        68    45     62    91
## 12       64     52     78        75                100
## 13       60     50     78        74    56     70    87
## 14              64     93        70   100     81    98
## 15       55     38     34       76    100    100   100
## 16       57     54     53             100     53    83
## 17              60     82       71     74     35    94
## 18                     71       47     69     68    88
## 19       56     53     67       99    100     57    93
## 20       61     63     80               79     49    90
## 21       54     57     95       39     78     84    86
## 22       50     59     87       78    100     82    93
## 23              83     64      100     52           86
## 24       60     60     51       91     87     71    76
## 25       61     60     76       99     79      2    95
## 26       57     55     61       84     80     18    92
## 27              60     85       43     48     31    85
## 28       59     59     80       68     93           94
## 29              69     77       65     82     47    84
## 30       63     56     64       69     64     82    90
## 31       57     66     81       98     88     77    91
## 32       63     79     66       43     76     68    93
## 33              68     75       95    100     30    92
## 34       63     51     50       86     80    100    98
## 35       60     70     92       94     97     24    90
## 36       59     63     84       92     56     63    89
## 37                     83       89     90     81    91
## 38                     81       41     57     47   100
## 39       55     41     66       89     70     68    80
## 40       54     49     55       65     47     29    88
## 41              63     47      100    100    100    93
## 42       56     58     71       70    100     88    98
## 43       55     61     69       66     63           92
## 44              51     81       63     92           89
## 45       68     77     65      100     99     56    81
## 46       63     61     89       94     94     35    92
## 47       61     71     58       97    100     69   100
## 48       54     54     93      100    100     63    92
## 49       61     41     81       95     37     52    88
## 50                     89       80     82     87    95
## 51                     58       78     98     30    93
```

3) Finding Missing values in my dataset:

a) Try finding NA values for the Pre-test using == “NA” or == NA or == “ “ . What is the output? **The only one that works properly is ==“”

```
rm(dt2)
dt2 <- read.table("data_ICA3.txt", sep="\t") #The variable dt2 represent the dataset(table)of the score
names(dt2)[1] <- "Pre-test"
#dt2$`Pre-test`==NA
#dt2$`Pre-test`=="NA"
dt2$`Pre-test`=="" #This is the only one that give me the right result
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
## [12] FALSE FALSE  TRUE FALSE FALSE  TRUE  TRUE FALSE FALSE FALSE FALSE
## [23]  TRUE FALSE FALSE FALSE  TRUE FALSE  TRUE FALSE FALSE FALSE  TRUE
## [34] FALSE FALSE FALSE  TRUE  TRUE FALSE FALSE  TRUE FALSE FALSE  TRUE
## [45] FALSE FALSE FALSE FALSE FALSE  TRUE  TRUE
```

b)Try using the is.na() function. Use is.na(scores$'Pre-test') on your data. What is the output? **The output should give TRUE at the positions where the data is missing.**

```
    #Other things I  tested:
      #v_test <- dt2$`Pre-test` #this give me a type integer. Factor with levels
      #v_test2 <- dt2[1] #This give me a list
      #typeof(v_test)
      #typeof(v_test2)
#Now testing the suggested command.
#is.na(dt2$`Pre-test`) #this one does not work proper, I do not know why.
#is.na(dt2[1]) #this one also does not work.
dt2$`Pre-test`=="" #this one does not work
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
## [12] FALSE FALSE  TRUE FALSE FALSE  TRUE  TRUE FALSE FALSE FALSE FALSE
## [23]  TRUE FALSE FALSE FALSE  TRUE FALSE  TRUE FALSE FALSE FALSE  TRUE
## [34] FALSE FALSE FALSE  TRUE  TRUE FALSE FALSE  TRUE FALSE FALSE  TRUE
## [45] FALSE FALSE FALSE FALSE FALSE  TRUE  TRUE
```

c)Use is.na(x) on the entire data set. What is the output? **The output should give TRUE at the positions where the data is missing.**

```
#dt2
#is.na(dt2) #THIS IS NOT WORKING, whyy? #commenting out this line for now
dt2=="" #This one work properly
```

```
##       Pre-test    V2    V3    V4    V5    V6    V7
##  [1,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [2,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [3,]    FALSE FALSE FALSE FALSE  TRUE FALSE FALSE
##  [4,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [5,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [6,]    FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
##  [7,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [8,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
##  [9,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [10,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [11,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [12,]    FALSE FALSE FALSE FALSE  TRUE  TRUE FALSE
## [13,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [14,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [15,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [16,]    FALSE FALSE FALSE  TRUE FALSE FALSE FALSE
## [17,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [18,]     TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
## [19,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [20,]    FALSE FALSE FALSE  TRUE FALSE FALSE FALSE
## [21,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [22,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [23,]     TRUE FALSE FALSE FALSE FALSE  TRUE FALSE
## [24,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [25,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [26,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [27,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [28,]    FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
## [29,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [30,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [31,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [32,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [33,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [34,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [35,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [36,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [37,]     TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
## [38,]     TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
## [39,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [40,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [41,]     TRUE FALSE FALSE FALSE FALSE FALSE FALSE
## [42,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [43,]    FALSE FALSE FALSE FALSE FALSE  TRUE FALSE
## [44,]     TRUE FALSE FALSE FALSE FALSE  TRUE FALSE
## [45,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [46,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [47,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [48,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [49,]    FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [50,]     TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
## [51,]     TRUE  TRUE FALSE FALSE FALSE FALSE FALSE
```

d) How many total missing values or “NA” are in the data? **The total of missing data is 29**

```
total_of_missing <- sum(dt2=="")
print(total_of_missing)
```

```
## [1] 29
```

```
anyNA(dt2,recursive = TRUE) #For some reason the is.na is not working well for me
```

```
## [1] FALSE
```

e)What happens when you try to use is.nan( ) or is.infinite( ) on the entire data set? To understand, look up these function in help Inf = negative or positive number that are infinity (too big for example number/0) NaN = Non a number (I number like 0/0 will be indefined or non a number)

```
is.infinite(dt2$`Pre-test`)
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [12] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [23] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [34] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [45] FALSE FALSE FALSE FALSE FALSE FALSE FALSE
```

```
is.nan(dt2$`Pre-test`)
```

```
##  [1] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [12] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [23] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [34] FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE FALSE
## [45] FALSE FALSE FALSE FALSE FALSE FALSE FALSE
```

f) To find the number of missing values per column: apply(is.na(scores),2,sum)

```
apply(dt2=="",2,sum)
```

```
## Pre-test       V2       V3       V4       V5       V6       V7
##       14        5        0        2        2        6        0
```

```
#other way
sum(dt2[2]=="")
```

```
## [1] 5
```

g) Repeat the above to find the number of missing values per row

```
apply(dt2=="",1,sum)
```

```
##  [1] 0 0 1 0 0 1 0 0 0 1 0 2 0 1 0 1 1 2 0 1 0 0 2 0 0 0 1 1 1 0 0 0 1 0 0
## [36] 0 2 2 0 0 1 0 1 2 0 0 0 0 0 2 2
```

```
#sum(dt2[3,]=="") #This is for the third row for example
```

h) Using the apply function, find the average of the scores per row: apply(scores,1, mean). What is the output? Does it make sense?

```
#apply(na.omit(dt2),1,mean)
#The one in the second argument means row, this data structure have two dimensions
apply((dt2!=""),1,mean) #Average per row omiting empty positions.
```

```
##  [1] 1.0000000 1.0000000 0.8571429 1.0000000 1.0000000 0.8571429 1.0000000
##  [8] 1.0000000 1.0000000 0.8571429 1.0000000 0.7142857 1.0000000 0.8571429
## [15] 1.0000000 0.8571429 0.8571429 0.7142857 1.0000000 0.8571429 1.0000000
## [22] 1.0000000 0.7142857 1.0000000 1.0000000 1.0000000 0.8571429 0.8571429
## [29] 0.8571429 1.0000000 1.0000000 1.0000000 0.8571429 1.0000000 1.0000000
## [36] 1.0000000 0.7142857 0.7142857 1.0000000 1.0000000 0.8571429 1.0000000
## [43] 0.8571429 0.7142857 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000
## [50] 0.7142857 0.7142857
```

i) As can be observed below 328 elements are remining after omiting the empty ones.

```
sum(dt2!="")
```

```
## [1] 328
```

j) The average per column is found in in a similar way as in h but using the 2 in the second argument of the apply comand.

```
apply((dt2!=""),2,mean)
```

```
##  Pre-test        V2        V3        V4        V5        V6        V7
## 0.7254902 0.9019608 1.0000000 0.9607843 0.9607843 0.8823529 1.0000000
```

k) Then, use this clean set of data to randomly sample. Generate 5 new samples from the existing clean set and save it to a new object called newSample:

```
scoresOmit <- dt2!=""
scoresOmit[sample(1:nrow(scoresOmit),5,replace = TRUE)]
```

```
## [1]  TRUE  TRUE FALSE  TRUE  TRUE
```

l) To combine this set with the existing set, you can use rbind(x,y)

```
r_scores <- rbind(scoresOmit,dt2)
r_scores
```

```
##     Pre-test     V2     V3       V4     V5     V6    V7
## 1       TRUE   TRUE   TRUE     TRUE   TRUE   TRUE  TRUE
## 2       TRUE   TRUE   TRUE     TRUE   TRUE   TRUE  TRUE
## 3       TRUE   TRUE   TRUE     TRUE  FALSE   TRUE  TRUE
## 4       TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 5       TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 6       TRUE   TRUE   TRUE    TRUE    TRUE  FALSE  TRUE
## 7       TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 8       TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 9       TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 10     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 11      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 12      TRUE   TRUE   TRUE    TRUE   FALSE  FALSE  TRUE
## 13      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 14     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 15      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 16      TRUE   TRUE   TRUE   FALSE    TRUE   TRUE  TRUE
## 17     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 18     FALSE  FALSE   TRUE    TRUE    TRUE   TRUE  TRUE
## 19      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 20      TRUE   TRUE   TRUE   FALSE    TRUE   TRUE  TRUE
## 21      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 22      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 23     FALSE   TRUE   TRUE    TRUE    TRUE  FALSE  TRUE
## 24      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 25      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 26      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 27     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 28      TRUE   TRUE   TRUE    TRUE    TRUE  FALSE  TRUE
## 29     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 30      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 31      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 32      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 33     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 34      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 35      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 36      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 37     FALSE  FALSE   TRUE    TRUE    TRUE   TRUE  TRUE
## 38     FALSE  FALSE   TRUE    TRUE    TRUE   TRUE  TRUE
## 39      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 40      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 41     FALSE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 42      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 43      TRUE   TRUE   TRUE    TRUE    TRUE  FALSE  TRUE
## 44     FALSE   TRUE   TRUE    TRUE    TRUE  FALSE  TRUE
## 45      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 46      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 47      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 48      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 49      TRUE   TRUE   TRUE    TRUE    TRUE   TRUE  TRUE
## 50     FALSE  FALSE   TRUE    TRUE    TRUE   TRUE  TRUE
## 51     FALSE  FALSE   TRUE    TRUE    TRUE   TRUE  TRUE
## 52  Pre-test Quiz 1 Quiz 2 Midterm  Quiz 3 Quiz 4 Final
## 53        56     49     95      64      78     72    90
## 54        58     66     82     100             79    91
## 55        63     45     61     100      83     48    87
## 56        50     44    100      92      45     69    78
## 57        58     64     81      59      64           97
## 58         61     56     57      100     75     44    87
## 59         63     58     56       80     40     56    85
## 60         67     64     79       72     76     75    90
## 61                72     62      100     80     89    89
## 62         56     50     68       68     45     62    91
## 63         64     52     78       75                 100
## 64         60     50     78       74     56     70    87
## 65                64     93       70    100     81    98
## 66         55     38     34       76    100    100   100
## 67         57     54     53             100     53    83
## 68                60     82       71     74     35    94
## 69                       71       47     69     68    88
## 70         56     53     67       99    100     57    93
## 71         61     63     80              79     49    90
## 72         54     57     95       39     78     84    86
## 73         50     59     87       78    100     82    93
## 74                83     64      100     52           86
## 75         60     60     51       91     87     71    76
## 76         61     60     76       99     79      2    95
## 77         57     55     61       84     80     18    92
## 78                60     85       43     48     31    85
## 79         59     59     80       68     93           94
## 80                69     77       65     82     47    84
## 81         63     56     64       69     64     82    90
## 82         57     66     81       98     88     77    91
## 83         63     79     66       43     76     68    93
## 84                68     75       95    100     30    92
## 85         63     51     50       86     80    100    98
## 86         60     70     92       94     97     24    90
## 87         59     63     84       92     56     63    89
## 88                       83       89     90     81    91
## 89                       81       41     57     47   100
## 90         55     41     66       89     70     68    80
## 91         54     49     55       65     47     29    88
## 92                63     47      100    100    100    93
## 93         56     58     71       70    100     88    98
## 94         55     61     69       66     63           92
## 95                51     81       63     92           89
## 96         68     77     65      100     99     56    81
## 97         63     61     89       94     94     35    92
## 98         61     71     58       97    100     69   100
## 99         54     54     93      100    100     63    92
## 100        61     41     81       95     37     52    88
## 101                      89       80     82     87    95
## 102                      58       78     98     30    93
```

m) To reassign “NA” values to 0

```
scores <- dt2
#levels(scores)
#scores[scores==""] <- 0
    #scores[scores==""] <- NA
scores[is.na(scores)] <- 0
```

n) The mean will change because the NA values are reemplace by zeros increasing the number of samples and the mean will be the

$$\sum_{i=1}^{n} X_i/n$$

In this case n will be bigger.