Worksheet-7a in R

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Packages

```
library(openxlsx)
library("writexl")
library(mlbench)
library(xlsx)
```

```
##
## Attaching package: 'xlsx'

## The following objects are masked from 'package:openxlsx':
##
##     createWorkbook, loadWorkbook, read.xlsx, saveWorkbook, write.xlsx
```

```
library(Hmisc)
```

```
## Loading required package: lattice

## Loading required package: survival

## Loading required package: Formula

## Loading required package: ggplot2

##
## Attaching package: 'Hmisc'

## The following objects are masked from 'package:base':
##
##     format.pval, units
```

```
library(pastecs)
library(readxl)
library("AppliedPredictiveModeling")
```

1. Create a data frame for the table below.

```
Student <- seq(1:10)
Pre_test <- c(55,54,47,57,51,61,57,54,63,58)
Post_test <- c(61,60,56,63,56,63,59,56,62,61)

Stude_scoresDF <- data.frame(Student,Pre_test,Post_test)
Stude_scoresDF
```

```
##   Student Pre_test Post_test
## 1       1       55        61
## 2       2       54        60
```

```
## 3        3      47        56
## 4        4      57        63
## 5        5      51        56
## 6        6      61        63
## 7        7      57        59
## 8        8      54        56
## 9        9      63        62
## 10      10      58        61
```

a. Compute the descriptive statistics using different packages (Hmisc and pastecs). Write the codes and its result.

```r
# Hmisc
Hmisc_d <- describe(Stude_scoresDF)
Hmisc_d
```

```
## Stude_scoresDF
##
##  3  Variables      10  Observations
## --------------------------------------------------------------------------------
## Student
##        n  missing distinct     Info     Mean      Gmd      .05      .10
##       10        0       10        1      5.5    3.667     1.45     1.90
##      .25      .50      .75      .90      .95
##     3.25     5.50     7.75     9.10     9.55
##
## lowest :  1  2  3  4  5, highest:  6  7  8  9 10
##
## Value         1   2   3   4   5   6   7   8   9  10
## Frequency     1   1   1   1   1   1   1   1   1   1
## Proportion 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1 0.1
## --------------------------------------------------------------------------------
## Pre_test
##        n  missing distinct     Info     Mean      Gmd
##       10        0        8    0.988     55.7    5.444
##
## lowest : 47 51 54 55 57, highest: 55 57 58 61 63
##
## Value       47  51  54  55  57  58  61  63
## Frequency    1   1   2   1   2   1   1   1
## Proportion 0.1 0.1 0.2 0.1 0.2 0.1 0.1 0.1
## --------------------------------------------------------------------------------
## Post_test
##        n  missing distinct     Info     Mean      Gmd
##       10        0        6    0.964     59.7    3.311
##
## lowest : 56 59 60 61 62, highest: 59 60 61 62 63
##
## Value       56  59  60  61  62  63
## Frequency    3   1   1   2   1   2
## Proportion 0.3 0.1 0.1 0.2 0.1 0.2
## --------------------------------------------------------------------------------
```

```r
# Pastecs
Pastecs_s <- stat.desc(Stude_scoresDF)
```

```
Pastecs_s
```

```
##                  Student     Pre_test    Post_test
## nbr.val       10.0000000  10.00000000  10.00000000
## nbr.null       0.0000000   0.00000000   0.00000000
## nbr.na         0.0000000   0.00000000   0.00000000
## min            1.0000000  47.00000000  56.00000000
## max           10.0000000  63.00000000  63.00000000
## range          9.0000000  16.00000000   7.00000000
## sum           55.0000000 557.00000000 597.00000000
## median         5.5000000  56.00000000  60.50000000
## mean           5.5000000  55.70000000  59.70000000
## SE.mean        0.9574271   1.46855938   0.89504811
## CI.mean.0.95   2.1658506   3.32211213   2.02473948
## var            9.1666667  21.56666667   8.01111111
## std.dev        3.0276504   4.64399254   2.83039063
## coef.var       0.5504819   0.08337509   0.04741023
```

2. The Department of Agriculture was studying the effects of several levels of a fertilizer on the growth of a plant. For some analyses, it might be useful to convert the fertilizer levels to an ordered factor.

The data were 10,10,10, 20,20,50,10,20,10,50,20,50,20,10.

a. Write the codes and describe the result.

```
data1 <- c(10,10,10,20,20,50,10,20,10,50,20,50,20,10)
data1
```

```
##  [1] 10 10 10 20 20 50 10 20 10 50 20 50 20 10
```

```
data1_orderedFactor <- factor(data1, ordered = TRUE)
data1_orderedFactor
```

```
##  [1] 10 10 10 20 20 50 10 20 10 50 20 50 20 10
## Levels: 10 < 20 < 50
```

```
# The given data were reorder or arranges the levels of the factors in ascending order.
```

3. Abdul Hassan, president of Floor Coverings Unlimited, has asked you to study the exercise levels undertaken by 10 subjects were "l", "n", "n", "i", "l" , "l", "n", "n", "i", "l" ; n=none, l=light, i=intense

a. What is the best way to represent this in R?

```
ten_sub <- factor(c("l","n","n","i","l","l","n","n","i","l"),
                  c("n", "l", "i"), ordered = TRUE)
ten_sub
```

```
##  [1] l n n i l l n n i l
## Levels: n < l < i
```

4. Sample of 30 tax accountants from all the states and territories of Australia and their individual state of origin is specified by a character vector of state mnemonics as:

```
state <- c("tas", "sa", "qld", "nsw", "nsw", "nt", "wa", "wa", "qld",
           "vic", "nsw", "vic", "qld", "qld", "sa", "tas", "sa", "nt",
           "wa", "vic", "qld", "nsw", "nsw", "wa", "sa", "act", "nsw",
           "vic", "vic", "act")
state
```

```
##  [1] "tas" "sa"  "qld" "nsw" "nsw" "nt"  "wa"  "wa"  "qld" "vic" "nsw" "vic"
## [13] "qld" "qld" "sa"  "tas" "sa"  "nt"  "wa"  "vic" "qld" "nsw" "nsw" "wa"
## [25] "sa"  "act" "nsw" "vic" "vic" "act"
```

a. Apply the factor function and factor level. Describe the results.

```
factorState <- factor(state)
factorState
```

```
##  [1] tas sa  qld nsw nsw nt  wa  wa  qld vic nsw vic qld qld sa  tas sa  nt  wa
## [20] vic qld nsw nsw wa  sa  act nsw vic vic act
## Levels: act nsw nt qld sa tas vic wa
```

```
levels(state)
```

```
## NULL
```

```
levels(factorState)
```

```
## [1] "act" "nsw" "nt"  "qld" "sa"  "tas" "vic" "wa"
```

```
# The given data was categorize and store it as levels. When using factor, It resulted to
# [1] tas sa  qld nsw nsw nt  wa  wa  qld vic nsw vic qld
# [14] qld sa  tas sa  nt  wa  vic qld nsw nsw wa  sa  act
# [27] nsw vic vic act
# When you directly check the levels of object state, it resulted as NULL.
# But when you check the levels using an already factored data, it resulted to
# [1] "act" "nsw" "nt"  "qld" "sa"  "tas" "vic" "wa"
```

5. From #4 - continuation:

```
incomes <- c(60, 49, 40, 61, 64, 60, 59, 54,
             62, 69, 70, 42, 56, 61, 61, 61, 58, 51, 48,
             65, 49, 49, 41, 48, 52, 46, 59, 46, 58, 43)
incomes
```

Suppose we have the incomes of the same tax accountants in another vector (insuitably large units of money)

```
##  [1] 60 49 40 61 64 60 59 54 62 69 70 42 56 61 61 61 58 51 48 65 49 49 41 48 52
## [26] 46 59 46 58 43
```

a. Calculate the sample mean income for each state we can now use the special function tapply():

```
incmeans <- tapply(incomes, factorState, mean)
```

Example: giving a means vector with the components labelled by the levels

Note: The function tapply() is used to apply a function, here mean(), to each group of components of the first argument, here incomes, defined by the levels of the second component, here statef2

2 that tapply() also works in this case when its second argument is not a factor,

e.g., 'tapply(incomes, state)', and this is true for quite a few other functions, since arguments are coerced to factors when necessary (using as.factor()).

b. Copy the results and interpret.

```
incmeans
```

```
##      act      nsw       nt      qld       sa      tas      vic       wa
## 44.50000 57.33333 55.50000 53.60000 55.00000 60.50000 56.00000 52.25000
```

```
# It creates a group summaries that was based on factor levels.
# The result was computes into a statistical measures.
```

6. Calculate the standard errors of the state income means (refer again to number 3)

```
stdError <- function(x) sqrt(var(x)/length(x))
```

```
incster <- tapply(incomes, factorState, stdError)
```

Note: After this assignment, the standard errors are calculated by:

a. What is the standard error? Write the codes.

```
incster <- tapply(incomes, factorState, stdError)
incster
```

```
##      act      nsw       nt      qld       sa      tas      vic       wa
## 1.500000 4.310195 4.500000 4.106093 2.738613 0.500000 5.244044 2.657536
```

b. Interpret the result.

```
# The result is a structure of the same length of the given factor.
# It shows all the standard deviation from act to wa.
```

7. Use the titanic dataset.

a. subset the titatic dataset of those who survived and not survived. Show the codes and its result.

```
data(Titanic)
Titanic <- data.frame(Titanic)
Titanic
```

```
##    Class    Sex   Age Survived Freq
## 1    1st   Male Child       No    0
## 2    2nd   Male Child       No    0
## 3    3rd   Male Child       No   35
## 4   Crew   Male Child       No    0
```

```
## 5     1st Female Child       No    0
## 6     2nd Female Child       No    0
## 7     3rd Female Child       No   17
## 8    Crew Female Child       No    0
## 9     1st   Male Adult       No  118
## 10    2nd   Male Adult       No  154
## 11    3rd   Male Adult       No  387
## 12   Crew   Male Adult       No  670
## 13    1st Female Adult       No    4
## 14    2nd Female Adult       No   13
## 15    3rd Female Adult       No   89
## 16   Crew Female Adult       No    3
## 17    1st   Male Child      Yes    5
## 18    2nd   Male Child      Yes   11
## 19    3rd   Male Child      Yes   13
## 20   Crew   Male Child      Yes    0
## 21    1st Female Child      Yes    1
## 22    2nd Female Child      Yes   13
## 23    3rd Female Child      Yes   14
## 24   Crew Female Child      Yes    0
## 25    1st   Male Adult      Yes   57
## 26    2nd   Male Adult      Yes   14
## 27    3rd   Male Adult      Yes   75
## 28   Crew   Male Adult      Yes  192
## 29    1st Female Adult      Yes  140
## 30    2nd Female Adult      Yes   80
## 31    3rd Female Adult      Yes   76
## 32   Crew Female Adult      Yes   20
```

```
subset_survive <- subset(Titanic, Survived == "Yes")
subset_survive
```

```
##    Class    Sex   Age Survived Freq
## 17    1st   Male Child      Yes    5
## 18    2nd   Male Child      Yes   11
## 19    3rd   Male Child      Yes   13
## 20   Crew   Male Child      Yes    0
## 21    1st Female Child      Yes    1
## 22    2nd Female Child      Yes   13
## 23    3rd Female Child      Yes   14
## 24   Crew Female Child      Yes    0
## 25    1st   Male Adult      Yes   57
## 26    2nd   Male Adult      Yes   14
## 27    3rd   Male Adult      Yes   75
## 28   Crew   Male Adult      Yes  192
## 29    1st Female Adult      Yes  140
## 30    2nd Female Adult      Yes   80
## 31    3rd Female Adult      Yes   76
## 32   Crew Female Adult      Yes   20
```

```
subset_died <- subset(Titanic, Survived == "No")
subset_died
```

```
##    Class    Sex   Age Survived Freq
## 1     1st   Male Child       No    0
```

```
## 2    2nd   Male Child       No    0
## 3    3rd   Male Child       No   35
## 4   Crew   Male Child       No    0
## 5    1st Female Child       No    0
## 6    2nd Female Child       No    0
## 7    3rd Female Child       No   17
## 8   Crew Female Child       No    0
## 9    1st   Male Adult       No  118
## 10   2nd   Male Adult       No  154
## 11   3rd   Male Adult       No  387
## 12  Crew   Male Adult       No  670
## 13   1st Female Adult       No    4
## 14   2nd Female Adult       No   13
## 15   3rd Female Adult       No   89
## 16  Crew Female Adult       No    3
```

8. The data sets are about the breast cancer Wisconsin. The samples arrive periodically as Dr. Wolberg reports his clinical cases. The database therefore reflects this chronological grouping of the data. You can create this dataset in Microsoft Excel.

```r
library(mlbench)
data("BreastCancer")
Data_Breast_Cancer <- data.frame(BreastCancer)
Data_Breast_Cancer
```

```
##           Id Cl.thickness Cell.size Cell.shape Marg.adhesion Epith.c.size
## 1    1000025            5         1          1             1            2
## 2    1002945            5         4          4             5            7
## 3    1015425            3         1          1             1            2
## 4    1016277            6         8          8             1            3
## 5    1017023            4         1          1             3            2
## 6    1017122            8        10         10             8            7
## 7    1018099            1         1          1             1            2
## 8    1018561            2         1          2             1            2
## 9    1033078            2         1          1             1            2
## 10   1033078            4         2          1             1            2
## 11   1035283            1         1          1             1            1
## 12   1036172            2         1          1             1            2
## 13   1041801            5         3          3             3            2
## 14   1043999            1         1          1             1            2
## 15   1044572            8         7          5            10            7
## 16   1047630            7         4          6             4            6
## 17   1048672            4         1          1             1            2
## 18   1049815            4         1          1             1            2
## 19   1050670           10         7          7             6            4
## 20   1050718            6         1          1             1            2
## 21   1054590            7         3          2            10            5
## 22   1054593           10         5          5             3            6
## 23   1056784            3         1          1             1            2
## 24   1057013            8         4          5             1            2
## 25   1059552            1         1          1             1            2
## 26   1065726            5         2          3             4            2
## 27   1066373            3         2          1             1            1
## 28   1066979            5         1          1             1            2
```

```
## 29   1067444        2       1       1        1       2
## 30   1070935        1       1       3        1       2
## 31   1070935        3       1       1        1       1
## 32   1071760        2       1       1        1       2
## 33   1072179       10       7       7        3       8
## 34   1074610        2       1       1        2       2
## 35   1075123        3       1       2        1       2
## 36   1079304        2       1       1        1       2
## 37   1080185       10      10      10        8       6
## 38   1081791        6       2       1        1       1
## 39   1084584        5       4       4        9       2
## 40   1091262        2       5       3        3       6
## 41   1096800        6       6       6        9       6
## 42   1099510       10       4       3        1       3
## 43   1100524        6      10      10        2       8
## 44   1102573        5       6       5        6      10
## 45   1103608       10      10      10        4       8
## 46   1103722        1       1       1        1       2
## 47   1105257        3       7       7        4       4
## 48   1105524        1       1       1        1       2
## 49   1106095        4       1       1        3       2
## 50   1106829        7       8       7        2       4
## 51   1108370        9       5       8        1       2
## 52   1108449        5       3       3        4       2
## 53   1110102       10       3       6        2       3
## 54   1110503        5       5       5        8      10
## 55   1110524       10       5       5        6       8
## 56   1111249       10       6       6        3       4
## 57   1112209        8      10      10        1       3
## 58   1113038        8       2       4        1       5
## 59   1113483        5       2       3        1       6
## 60   1113906        9       5       5        2       2
## 61   1115282        5       3       5        5       3
## 62   1115293        1       1       1        1       2
## 63   1116116        9      10      10        1      10
## 64   1116132        6       3       4        1       5
## 65   1116192        1       1       1        1       2
## 66   1116998       10       4       2        1       3
## 67   1117152        4       1       1        1       2
## 68   1118039        5       3       4        1       8
## 69   1120559        8       3       8        3       4
## 70   1121732        1       1       1        1       2
## 71   1121919        5       1       3        1       2
## 72   1123061        6      10       2        8      10
## 73   1124651        1       3       3        2       2
## 74   1125035        9       4       5       10       6
## 75   1126417       10       6       4        1       3
## 76   1131294        1       1       2        1       2
## 77   1132347        1       1       4        1       2
## 78   1133041        5       3       1        2       2
## 79   1133136        3       1       1        1       2
## 80   1136142        2       1       1        1       3
## 81   1137156        2       2       2        1       1
## 82   1143978        4       1       1        2       2
```

```
## 83    1143978                5            2            1               1              2
## 84    1147044                3            1            1               1              2
## 85    1147699                3            5            7               8              8
## 86    1147748                5           10            6               1             10
## 87    1148278                3            3            6               4              5
## 88    1148873                3            6            6               6              5
## 89    1152331                4            1            1               1              2
## 90    1155546                2            1            1               2              3
## 91    1156272                1            1            1               1              2
## 92    1156948                3            1            1               2              2
## 93    1157734                4            1            1               1              2
## 94    1158247                1            1            1               1              2
## 95    1160476                2            1            1               1              2
## 96    1164066                1            1            1               1              2
## 97    1165297                2            1            1               2              2
## 98    1165790                5            1            1               1              2
## 99    1165926                9            6            9               2             10
## 100   1166630                7            5            6              10              5
## 101   1166654               10            3            5               1             10
## 102   1167439                2            3            4               4              2
## 103   1167471                4            1            2               1              2
## 104   1168359                8            2            3               1              6
## 105   1168736               10           10           10              10             10
## 106   1169049                7            3            4               4              3
## 107   1170419               10           10           10               8              2
## 108   1170420                1            6            8              10              8
## 109   1171710                1            1            1               1              2
## 110   1171710                6            5            4               4              3
## 111   1171795                1            3            1               2              2
## 112   1171845                8            6            4               3              5
## 113   1172152               10            3            3              10              2
## 114   1173216               10           10           10               3             10
## 115   1173235                3            3            2               1              2
## 116   1173347                1            1            1               1              2
## 117   1173347                8            3            3               1              2
## 118   1173509                4            5            5              10              4
## 119   1173514                1            1            1               1              4
## 120   1173681                3            2            1               1              2
## 121   1174057                1            1            2               2              2
## 122   1174057                4            2            1               1              2
## 123   1174131               10           10           10               2             10
## 124   1174428                5            3            5               1              8
## 125   1175937                5            4            6               7              9
## 126   1176406                1            1            1               1              2
## 127   1176881                7            5            3               7              4
## 128   1177027                3            1            1               1              2
## 129   1177399                8            3            5               4              5
## 130   1177512                1            1            1               1             10
## 131   1178580                5            1            3               1              2
## 132   1179818                2            1            1               1              2
## 133   1180194                5           10            8              10              8
## 134   1180523                3            1            1               1              2
## 135   1180831                3            1            1               1              3
## 136   1181356                5            1            1               1              2
```

```
## 137  1182404           4         1          1            1          2
## 138  1182410           3         1          1            1          2
## 139  1183240           4         1          2            1          2
## 140  1183246           1         1          1            1          1
## 141  1183516           3         1          1            1          2
## 142  1183911           2         1          1            1          2
## 143  1183983           9         5          5            4          4
## 144  1184184           1         1          1            1          2
## 145  1184241           2         1          1            1          2
## 146  1184840           1         1          3            1          2
## 147  1185609           3         4          5            2          6
## 148  1185610           1         1          1            1          3
## 149  1187457           3         1          1            3          8
## 150  1187805           8         8          7            4         10
## 151  1188472           1         1          1            1          1
## 152  1189266           7         2          4            1          6
## 153  1189286          10        10          8            6          4
## 154  1190394           4         1          1            1          2
## 155  1190485           1         1          1            1          2
## 156  1192325           5         5          5            6          3
## 157  1193091           1         2          2            1          2
## 158  1193210           2         1          1            1          2
## 159  1193683           1         1          2            1          3
## 160  1196295           9         9         10            3          6
## 161  1196915          10         7          7            4          5
## 162  1197080           4         1          1            1          2
## 163  1197270           3         1          1            1          2
## 164  1197440           1         1          1            2          1
## 165  1197510           5         1          1            1          2
## 166  1197979           4         1          1            1          2
## 167  1197993           5         6          7            8          8
## 168  1198128          10         8         10           10          6
## 169  1198641           3         1          1            1          2
## 170  1199219           1         1          1            2          1
## 171  1199731           3         1          1            1          2
## 172  1199983           1         1          1            1          2
## 173  1200772           1         1          1            1          2
## 174  1200847           6        10         10           10          8
## 175  1200892           8         6          5            4          3
## 176  1200952           5         8          7            7         10
## 177  1201834           2         1          1            1          2
## 178  1201936           5        10         10            3          8
## 179  1202125           4         1          1            1          2
## 180  1202812           5         3          3            3          6
## 181  1203096           1         1          1            1          1
## 182  1204242           1         1          1            1          2
## 183  1204898           6         1          1            1          2
## 184  1205138           5         8          8            8          5
## 185  1205579           8         7          6            4          4
## 186  1206089           2         1          1            1          1
## 187  1206695           1         5          8            6          5
## 188  1206841          10         5          6           10          6
## 189  1207986           5         8          4           10          5
## 190  1208301           1         2          3            1          2
```

```
## 191   1210963       10     10     10      8      6
## 192   1211202        7      5     10     10     10
## 193   1212232        5      1      1      1      2
## 194   1212251        1      1      1      1      2
## 195   1212422        3      1      1      1      2
## 196   1212422        4      1      1      1      2
## 197   1213375        8      4      4      5      4
## 198   1213383        5      1      1      4      2
## 199   1214092        1      1      1      1      2
## 200   1214556        3      1      1      1      2
## 201   1214966        9      7      7      5      5
## 202   1216694       10      8      8      4     10
## 203   1216947        1      1      1      1      2
## 204   1217051        5      1      1      1      2
## 205   1217264        1      1      1      1      2
## 206   1218105        5     10     10      9      6
## 207   1218741       10     10      9      3      7
## 208   1218860        1      1      1      1      1
## 209   1218860        1      1      1      1      1
## 210   1219406        5      1      1      1      1
## 211   1219525        8     10     10     10      5
## 212   1219859        8     10      8      8      4
## 213   1220330        1      1      1      1      2
## 214   1221863       10     10     10     10      7
## 215   1222047       10     10     10     10      3
## 216   1222936        8      7      8      7      5
## 217   1223282        1      1      1      1      2
## 218   1223426        1      1      1      1      2
## 219   1223793        6     10      7      7      6
## 220   1223967        6      1      3      1      2
## 221   1224329        1      1      1      2      2
## 222   1225799       10      6      4      3     10
## 223   1226012        4      1      1      3      1
## 224   1226612        7      5      6      3      3
## 225   1227210       10      5      5      6      3
## 226   1227244        1      1      1      1      2
## 227   1227481       10      5      7      4      4
## 228   1228152        8      9      9      5      3
## 229   1228311        1      1      1      1      1
## 230   1230175       10     10     10      3     10
## 231   1230688        7      4      7      4      3
## 232   1231387        6      8      7      5      6
## 233   1231706        8      4      6      3      3
## 234   1232225       10      4      5      5      5
## 235   1236043        3      3      2      1      3
## 236   1241232        3      1      4      1      2
## 237   1241559       10      8      8      2      8
## 238   1241679        9      8      8      5      6
## 239   1242364        8     10     10      8      6
## 240   1243256       10      4      3      2      3
## 241   1270479        5      1      3      3      2
## 242   1276091        3      1      1      3      1
## 243   1277018        2      1      1      1      2
## 244    128059        1      1      1      1      2
```

##	245	1285531	1	1	1	1	2
##	246	1287775	5	1	1	2	2
##	247	144888	8	10	10	8	5
##	248	145447	8	4	4	1	2
##	249	167528	4	1	1	1	2
##	250	169356	3	1	1	1	2
##	251	183913	1	2	2	1	2
##	252	191250	10	4	4	10	2
##	253	1017023	6	3	3	5	3
##	254	1100524	6	10	10	2	8
##	255	1116116	9	10	10	1	10
##	256	1168736	5	6	6	2	4
##	257	1182404	3	1	1	1	2
##	258	1182404	3	1	1	1	2
##	259	1198641	3	1	1	1	2
##	260	242970	5	7	7	1	5
##	261	255644	10	5	8	10	3
##	262	263538	5	10	10	6	10
##	263	274137	8	8	9	4	5
##	264	303213	10	4	4	10	6
##	265	314428	7	9	4	10	10
##	266	1182404	5	1	4	1	2
##	267	1198641	10	10	6	3	3
##	268	320675	3	3	5	2	3
##	269	324427	10	8	8	2	3
##	270	385103	1	1	1	1	2
##	271	390840	8	4	7	1	3
##	272	411453	5	1	1	1	2
##	273	320675	3	3	5	2	3
##	274	428903	7	2	4	1	3
##	275	431495	3	1	1	1	2
##	276	432809	3	1	3	1	2
##	277	434518	3	1	1	1	2
##	278	452264	1	1	1	1	2
##	279	456282	1	1	1	1	2
##	280	476903	10	5	7	3	3
##	281	486283	3	1	1	1	2
##	282	486662	2	1	1	2	2
##	283	488173	1	4	3	10	4
##	284	492268	10	4	6	1	2
##	285	508234	7	4	5	10	2
##	286	527363	8	10	10	10	8
##	287	529329	10	10	10	10	10
##	288	535331	3	1	1	1	3
##	289	543558	6	1	3	1	4
##	290	555977	5	6	6	8	6
##	291	560680	1	1	1	1	2
##	292	561477	1	1	1	1	2
##	293	563649	8	8	8	1	2
##	294	601265	10	4	4	6	2
##	295	606140	1	1	1	1	2
##	296	606722	5	5	7	8	6
##	297	616240	5	3	4	3	4
##	298	61634	5	4	3	1	2

```
## 299   625201          8        2        1         1         5
## 300    63375          9        1        2         6         4
## 301   635844          8        4       10         5         4
## 302   636130          1        1        1         1         2
## 303   640744         10       10       10         7         9
## 304   646904          1        1        1         1         2
## 305   653777          8        3        4         9         3
## 306   659642         10        8        4         4         4
## 307   666090          1        1        1         1         2
## 308   666942          1        1        1         1         2
## 309   667204          7        8        7         6         4
## 310   673637          3        1        1         1         2
## 311   684955          2        1        1         1         3
## 312   688033          1        1        1         1         2
## 313   691628          8        6        4        10        10
## 314   693702          1        1        1         1         2
## 315   704097          1        1        1         1         1
## 316   704168          4        6        5         6         7
## 317   706426          5        5        5         2         5
## 318   709287          6        8        7         8         6
## 319   718641          1        1        1         1         5
## 320   721482          4        4        4         4         6
## 321   730881          7        6        3         2         5
## 322   733639          3        1        1         1         2
## 323   733639          3        1        1         1         2
## 324   733823          5        4        6        10         2
## 325   740492          1        1        1         1         2
## 326   743348          3        2        2         1         2
## 327   752904         10        1        1         1         2
## 328   756136          1        1        1         1         2
## 329   760001          8       10        3         2         6
## 330   760239         10        4        6         4         5
## 331    76389         10        4        7         2         2
## 332   764974          5        1        1         1         2
## 333   770066          5        2        2         2         2
## 334   785208          5        4        6         6         4
## 335   785615          8        6        7         3         3
## 336   792744          1        1        1         1         2
## 337   797327          6        5        5         8         4
## 338   798429          1        1        1         1         2
## 339   704097          1        1        1         1         1
## 340   806423          8        5        5         5         2
## 341   809912         10        3        3         1         2
## 342   810104          1        1        1         1         2
## 343   814265          2        1        1         1         2
## 344   814911          1        1        1         1         2
## 345   822829          7        6        4         8        10
## 346   826923          1        1        1         1         2
## 347   830690          5        2        2         2         3
## 348   831268          1        1        1         1         1
## 349   832226          3        4        4        10         5
## 350   832567          4        2        3         5         3
## 351   836433          5        1        1         3         2
## 352   837082          2        1        1         1         2
```

```
## 353   846832         3      4      5      3      7
## 354   850831         2      7     10     10      7
## 355   855524         1      1      1      1      2
## 356   857774         4      1      1      1      3
## 357   859164         5      3      3      1      3
## 358   859350         8     10     10      7     10
## 359   866325         8     10      5      3      8
## 360   873549        10      3      5      4      3
## 361   877291         6     10     10     10     10
## 362   877943         3     10      3     10      6
## 363   888169         3      2      2      1      4
## 364   888523         4      4      4      2      2
## 365   896404         2      1      1      1      2
## 366   897172         2      1      1      1      2
## 367    95719         6     10     10     10      8
## 368   160296         5      8      8     10      5
## 369   342245         1      1      3      1      2
## 370   428598         1      1      3      1      1
## 371   492561         4      3      2      1      3
## 372   493452         1      1      3      1      2
## 373   493452         4      1      2      1      2
## 374   521441         5      1      1      2      2
## 375   560680         3      1      2      1      2
## 376   636437         1      1      1      1      2
## 377   640712         1      1      1      1      2
## 378   654244         1      1      1      1      1
## 379   657753         3      1      1      4      3
## 380   685977         5      3      4      1      4
## 381   805448         1      1      1      1      2
## 382   846423        10      6      3      6      4
## 383  1002504         3      2      2      2      2
## 384  1022257         2      1      1      1      2
## 385  1026122         2      1      1      1      2
## 386  1071084         3      3      2      2      3
## 387  1080233         7      6      6      3      2
## 388  1114570         5      3      3      2      3
## 389  1114570         2      1      1      1      2
## 390  1116715         5      1      1      1      3
## 391  1131411         1      1      1      2      2
## 392  1151734        10      8      7      4      3
## 393  1156017         3      1      1      1      2
## 394  1158247         1      1      1      1      1
## 395  1158405         1      2      3      1      2
## 396  1168278         3      1      1      1      2
## 397  1176187         3      1      1      1      2
## 398  1196263         4      1      1      1      2
## 399  1196475         3      2      1      1      2
## 400  1206314         1      2      3      1      2
## 401  1211265         3     10      8      7      6
## 402  1213784         3      1      1      1      2
## 403  1223003         5      3      3      1      2
## 404  1223306         3      1      1      1      2
## 405  1223543         1      2      1      3      2
## 406  1229929         1      1      1      1      2
```

```
## 407  1231853         4         2         2         1         2
## 408  1234554         1         1         1         1         2
## 409  1236837         2         3         2         2         2
## 410  1237674         3         1         2         1         2
## 411  1238021         1         1         1         1         2
## 412  1238464         1         1         1         1         1
## 413  1238633        10        10        10         6         8
## 414  1238915         5         1         2         1         2
## 415  1238948         8         5         6         2         3
## 416  1239232         3         3         2         6         3
## 417  1239347         8         7         8         5        10
## 418  1239967         1         1         1         1         2
## 419  1240337         5         2         2         2         2
## 420  1253505         2         3         1         1         5
## 421  1255384         3         2         2         3         2
## 422  1257200        10        10        10         7        10
## 423  1257648         4         3         3         1         2
## 424  1257815         5         1         3         1         2
## 425  1257938         3         1         1         1         2
## 426  1258549         9        10        10        10        10
## 427  1258556         5         3         6         1         2
## 428  1266154         8         7         8         2         4
## 429  1272039         1         1         1         1         2
## 430  1276091         2         1         1         1         2
## 431  1276091         1         3         1         1         2
## 432  1276091         5         1         1         3         4
## 433  1277629         5         1         1         1         2
## 434  1293439         3         2         2         3         2
## 435  1293439         6         9         7         5         5
## 436  1294562        10         8        10         1         3
## 437  1295186        10        10        10         1         6
## 438   527337         4         1         1         1         2
## 439   558538         4         1         3         3         2
## 440   566509         5         1         1         1         2
## 441   608157        10         4         3        10         4
## 442   677910         5         2         2         4         2
## 443   734111         1         1         1         3         2
## 444   734111         1         1         1         1         2
## 445   780555         5         1         1         6         3
## 446   827627         2         1         1         1         2
## 447  1049837         1         1         1         1         2
## 448  1058849         5         1         1         1         2
## 449  1182404         1         1         1         1         1
## 450  1193544         5         7         9         8         6
## 451  1201870         4         1         1         3         1
## 452  1202253         5         1         1         1         2
## 453  1227081         3         1         1         3         2
## 454  1230994         4         5         5         8         6
## 455  1238410         2         3         1         1         3
## 456  1246562        10         2         2         1         2
## 457  1257470        10         6         5         8         5
## 458  1259008         8         8         9         6         6
## 459  1266124         5         1         2         1         2
## 460  1267898         5         1         3         1         2
```

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## 461  1268313               5          1          1             3           2
## 462  1268804               3          1          1             1           2
## 463  1276091               6          1          1             3           2
## 464  1280258               4          1          1             1           2
## 465  1293966               4          1          1             1           2
## 466  1296572              10          9          8             7           6
## 467  1298416              10          6          6             2           4
## 468  1299596               6          6          6             5           4
## 469  1105524               4          1          1             1           2
## 470  1181685               1          1          2             1           2
## 471  1211594               3          1          1             1           1
## 472  1238777               6          1          1             3           2
## 473  1257608               6          1          1             1           1
## 474  1269574               4          1          1             1           2
## 475  1277145               5          1          1             1           2
## 476  1287282               3          1          1             1           2
## 477  1296025               4          1          2             1           2
## 478  1296263               4          1          1             1           2
## 479  1296593               5          2          1             1           2
## 480  1299161               4          8          7            10           4
## 481  1301945               5          1          1             1           1
## 482  1302428               5          3          2             4           2
## 483  1318169               9         10         10            10          10
## 484   474162               8          7          8             5           5
## 485   787451               5          1          2             1           2
## 486  1002025               1          1          1             3           1
## 487  1070522               3          1          1             1           1
## 488  1073960              10         10         10            10           6
## 489  1076352               3          6          4            10           3
## 490  1084139               6          3          2             1           3
## 491  1115293               1          1          1             1           2
## 492  1119189               5          8          9             4           3
## 493  1133991               4          1          1             1           1
## 494  1142706               5         10         10            10           6
## 495  1155967               5          1          2            10           4
## 496  1170945               3          1          1             1           1
## 497  1181567               1          1          1             1           1
## 498  1182404               4          2          1             1           2
## 499  1204558               4          1          1             1           2
## 500  1217952               4          1          1             1           2
## 501  1224565               6          1          1             1           2
## 502  1238186               4          1          1             1           2
## 503  1253917               4          1          1             2           2
## 504  1265899               4          1          1             1           2
## 505  1268766               1          1          1             1           2
## 506  1277268               3          3          1             1           2
## 507  1286943               8         10         10            10           7
## 508  1295508               1          1          1             1           2
## 509  1297327               5          1          1             1           2
## 510  1297522               2          1          1             1           2
## 511  1298360               1          1          1             1           2
## 512  1299924               5          1          1             1           2
## 513  1299994               5          1          1             1           2
## 514  1304595               3          1          1             1           1
```

```
## 515  1306282        6    6    7    10    3
## 516  1313325        4   10    4     7    3
## 517  1320077        1    1    1     1    1
## 518  1320077        1    1    1     1    1
## 519  1320304        3    1    2     2    2
## 520  1330439        4    7    8     3    4
## 521   333093        1    1    1     1    3
## 522   369565        4    1    1     1    3
## 523   412300       10    4    5     4    3
## 524   672113        7    5    6    10    4
## 525   749653        3    1    1     1    2
## 526   769612        3    1    1     2    2
## 527   769612        4    1    1     1    2
## 528   798429        4    1    1     1    2
## 529   807657        6    1    3     2    2
## 530  8233704        4    1    1     1    1
## 531   837480        7    4    4     3    4
## 532   867392        4    2    2     1    2
## 533   869828        1    1    1     1    1
## 534  1043068        3    1    1     1    2
## 535  1056171        2    1    1     1    2
## 536  1061990        1    1    3     2    2
## 537  1113061        5    1    1     1    2
## 538  1116192        5    1    2     1    2
## 539  1135090        4    1    1     1    2
## 540  1145420        6    1    1     1    2
## 541  1158157        5    1    1     1    2
## 542  1171578        3    1    1     1    2
## 543  1174841        5    3    1     1    2
## 544  1184586        4    1    1     1    2
## 545  1186936        2    1    3     2    2
## 546  1197527        5    1    1     1    2
## 547  1222464        6   10   10    10    4
## 548  1240603        2    1    1     1    1
## 549  1240603        3    1    1     1    1
## 550  1241035        7    8    3     7    4
## 551  1287971        3    1    1     1    2
## 552  1289391        1    1    1     1    2
## 553  1299924        3    2    2     2    2
## 554  1306339        4    4    2     1    2
## 555  1313658        3    1    1     1    2
## 556  1313982        4    3    1     1    2
## 557  1321264        5    2    2     2    1
## 558  1321321        5    1    1     3    2
## 559  1321348        2    1    1     1    2
## 560  1321931        5    1    1     1    2
## 561  1321942        5    1    1     1    2
## 562  1321942        5    1    1     1    2
## 563  1328331        1    1    1     1    2
## 564  1328755        3    1    1     1    2
## 565  1331405        4    1    1     1    2
## 566  1331412        5    7   10    10    5
## 567  1333104        3    1    2     1    2
## 568  1334071        4    1    1     1    2
```

```
## 569  1343068           8          4          4             1             6
## 570  1343374          10         10          8            10             6
## 571  1344121           8         10          4             4             8
## 572   142932           7          6         10             5             3
## 573   183936           3          1          1             1             2
## 574   324382           1          1          1             1             2
## 575   378275          10          9          7             3             4
## 576   385103           5          1          2             1             2
## 577   690557           5          1          1             1             2
## 578   695091           1          1          1             1             2
## 579   695219           1          1          1             1             2
## 580   824249           1          1          1             1             2
## 581   871549           5          1          2             1             2
## 582   878358           5          7         10             6             5
## 583  1107684           6         10          5             5             4
## 584  1115762           3          1          1             1             2
## 585  1217717           5          1          1             6             3
## 586  1239420           1          1          1             1             2
## 587  1254538           8         10         10            10             6
## 588  1261751           5          1          1             1             2
## 589  1268275           9          8          8             9             6
## 590  1272166           5          1          1             1             2
## 591  1294261           4         10          8             5             4
## 592  1295529           2          5          7             6             4
## 593  1298484          10          3          4             5             3
## 594  1311875           5          1          2             1             2
## 595  1315506           4          8          6             3             4
## 596  1320141           5          1          1             1             2
## 597  1325309           4          1          2             1             2
## 598  1333063           5          1          3             1             2
## 599  1333495           3          1          1             1             2
## 600  1334659           5          2          4             1             1
## 601  1336798           3          1          1             1             2
## 602  1344449           1          1          1             1             1
## 603  1350568           4          1          1             1             2
## 604  1352663           5          4          6             8             4
## 605   188336           5          3          2             8             5
## 606   352431          10          5         10             3             5
## 607   353098           4          1          1             2             2
## 608   411453           1          1          1             1             2
## 609   557583           5         10         10            10            10
## 610   636375           5          1          1             1             2
## 611   736150          10          4          3            10             3
## 612   803531           5         10         10            10             5
## 613   822829           8         10         10            10             6
## 614  1016634           2          3          1             1             2
## 615  1031608           2          1          1             1             1
## 616  1041043           4          1          3             1             2
## 617  1042252           3          1          1             1             2
## 618  1057067           1          1          1             1             1
## 619  1061990           4          1          1             1             2
## 620  1073836           5          1          1             1             2
## 621  1083817           3          1          1             1             2
## 622  1096352           6          3          3             3             3
```

```
## 623   1140597      7      1      2      3      2
## 624   1149548      1      1      1      1      2
## 625   1174009      5      1      1      2      1
## 626   1183596      3      1      3      1      3
## 627   1190386      4      6      6      5      7
## 628   1190546      2      1      1      1      2
## 629   1213273      2      1      1      1      2
## 630   1218982      4      1      1      1      2
## 631   1225382      6      2      3      1      2
## 632   1235807      5      1      1      1      2
## 633   1238777      1      1      1      1      2
## 634   1253955      8      7      4      4      5
## 635   1257366      3      1      1      1      2
## 636   1260659      3      1      4      1      2
## 637   1268952     10     10      7      8      7
## 638   1275807      4      2      4      3      2
## 639   1277792      4      1      1      1      2
## 640   1277792      5      1      1      3      2
## 641   1285722      4      1      1      3      2
## 642   1288608      3      1      1      1      2
## 643   1290203      3      1      1      1      2
## 644   1294413      1      1      1      1      2
## 645   1299596      2      1      1      1      2
## 646   1303489      3      1      1      1      2
## 647   1311033      1      2      2      1      2
## 648   1311108      1      1      1      3      2
## 649   1315807      5     10     10     10     10
## 650   1318671      3      1      1      1      2
## 651   1319609      3      1      1      2      3
## 652   1323477      1      2      1      3      2
## 653   1324572      5      1      1      1      2
## 654   1324681      4      1      1      1      2
## 655   1325159      3      1      1      1      2
## 656   1326892      3      1      1      1      2
## 657   1330361      5      1      1      1      2
## 658   1333877      5      4      5      1      8
## 659   1334015      7      8      8      7      3
## 660   1334667      1      1      1      1      2
## 661   1339781      1      1      1      1      2
## 662   1339781      4      1      1      1      2
## 663  13454352      1      1      3      1      2
## 664   1345452      1      1      3      1      2
## 665   1345593      3      1      1      3      2
## 666   1347749      1      1      1      1      2
## 667   1347943      5      2      2      2      2
## 668   1348851      3      1      1      1      2
## 669   1350319      5      7      4      1      6
## 670   1350423      5     10     10      8      5
## 671   1352848      3     10      7      8      5
## 672   1353092      3      2      1      2      2
## 673   1354840      2      1      1      1      2
## 674   1354840      5      3      2      1      3
## 675   1355260      1      1      1      1      2
## 676   1365075      4      1      4      1      2
```

```
## 677  1365328            1          1          2             1             2
## 678  1368267            5          1          1             1             2
## 679  1368273            1          1          1             1             2
## 680  1368882            2          1          1             1             2
## 681  1369821           10         10         10            10             5
## 682  1371026            5         10         10            10             4
## 683  1371920            5          1          1             1             2
## 684   466906            1          1          1             1             2
## 685   466906            1          1          1             1             2
## 686   534555            1          1          1             1             2
## 687   536708            1          1          1             1             2
## 688   566346            3          1          1             1             2
## 689   603148            4          1          1             1             2
## 690   654546            1          1          1             1             2
## 691   654546            1          1          1             3             2
## 692   695091            5         10         10             5             4
## 693   714039            3          1          1             1             2
## 694   763235            3          1          1             1             2
## 695   776715            3          1          1             1             3
## 696   841769            2          1          1             1             2
## 697   888820            5         10         10             3             7
## 698   897471            4          8          6             4             3
## 699   897471            4          8          8             5             4
##     Bare.nuclei Bl.cromatin Normal.nucleoli Mitoses     Class
## 1             1           3               1       1    benign
## 2            10           3               2       1    benign
## 3             2           3               1       1    benign
## 4             4           3               7       1    benign
## 5             1           3               1       1    benign
## 6            10           9               7       1 malignant
## 7            10           3               1       1    benign
## 8             1           3               1       1    benign
## 9             1           1               1       5    benign
## 10            1           2               1       1    benign
## 11            1           3               1       1    benign
## 12            1           2               1       1    benign
## 13            3           4               4       1 malignant
## 14            3           3               1       1    benign
## 15            9           5               5       4 malignant
## 16            1           4               3       1 malignant
## 17            1           2               1       1    benign
## 18            1           3               1       1    benign
## 19           10           4               1       2 malignant
## 20            1           3               1       1    benign
## 21           10           5               4       4 malignant
## 22            7           7              10       1 malignant
## 23            1           2               1       1    benign
## 24         <NA>           7               3       1 malignant
## 25            1           3               1       1    benign
## 26            7           3               6       1 malignant
## 27            1           2               1       1    benign
## 28            1           2               1       1    benign
## 29            1           2               1       1    benign
## 30            1           1               1       1    benign
```

```
## 31            1           2               1       1    benign
## 32            1           3               1       1    benign
## 33            5           7               4       3 malignant
## 34            1           3               1       1    benign
## 35            1           2               1       1    benign
## 36            1           2               1       1    benign
## 37            1           8               9       1 malignant
## 38            1           7               1       1    benign
## 39           10           5               6       1 malignant
## 40            7           7               5       1 malignant
## 41         <NA>           7               8       1    benign
## 42            3           6               5       2 malignant
## 43           10           7               3       3 malignant
## 44            1           3               1       1 malignant
## 45            1           8              10       1 malignant
## 46            1           2               1       2    benign
## 47            9           4               8       1 malignant
## 48            1           2               1       1    benign
## 49            1           3               1       1    benign
## 50            8           3               8       2 malignant
## 51            3           2               1       5 malignant
## 52            4           3               4       1 malignant
## 53            5           4              10       2 malignant
## 54            8           7               3       7 malignant
## 55            8           7               1       1 malignant
## 56            5           3               6       1 malignant
## 57            6           3               9       1 malignant
## 58            1           5               4       4 malignant
## 59           10           5               1       1 malignant
## 60            2           5               1       1 malignant
## 61            3           4              10       1 malignant
## 62            2           2               1       1    benign
## 63            8           3               3       1 malignant
## 64            2           3               9       1 malignant
## 65            1           2               1       1    benign
## 66            2           4               3      10 malignant
## 67            1           3               1       1    benign
## 68           10           4               9       1 malignant
## 69            9           8               9       8 malignant
## 70            1           3               2       1    benign
## 71            1           2               1       1    benign
## 72            2           7               8      10 malignant
## 73            1           7               2       1    benign
## 74           10           4               8       1 malignant
## 75            4           3               2       3 malignant
## 76            2           4               2       1    benign
## 77            1           2               1       1    benign
## 78            1           2               1       1    benign
## 79            3           3               1       1    benign
## 80            1           2               1       1    benign
## 81            1           7               1       1    benign
## 82            1           2               1       1    benign
## 83            1           3               1       1    benign
## 84            2           7               1       1    benign
```

```
## 85            9          7             10       7 malignant
## 86            4          4             10      10 malignant
## 87            8          4              4       1 malignant
## 88           10          6              8       3 malignant
## 89            1          3              1       1    benign
## 90            1          2              1       1    benign
## 91            1          3              1       1    benign
## 92            1          1              1       1    benign
## 93            1          3              1       1    benign
## 94            1          2              1       1    benign
## 95            1          3              1       1    benign
## 96            1          3              1       1    benign
## 97            1          1              1       1    benign
## 98            1          3              1       1    benign
## 99            6          2              9      10 malignant
## 100          10          7              9       4 malignant
## 101           5          3             10       2 malignant
## 102           5          2              5       1 malignant
## 103           1          3              1       1    benign
## 104           3          7              1       1 malignant
## 105           1          8              8       8 malignant
## 106           3          3              2       7 malignant
## 107          10          4              1       1 malignant
## 108          10          5              7       1 malignant
## 109           1          2              3       1    benign
## 110           9          7              8       3 malignant
## 111           2          5              3       2    benign
## 112           9          3              1       1 malignant
## 113          10          7              3       3 malignant
## 114           8          8              1       1 malignant
## 115           3          3              1       1    benign
## 116           5          1              1       1    benign
## 117           2          3              2       1    benign
## 118          10          7              5       8 malignant
## 119           3          1              1       1    benign
## 120           2          3              1       1    benign
## 121           1          3              1       1    benign
## 122           2          3              1       1    benign
## 123          10          5              3       3 malignant
## 124          10          5              3       1 malignant
## 125           7          8             10       1 malignant
## 126           1          2              1       1    benign
## 127          10          7              5       5 malignant
## 128           1          3              1       1    benign
## 129          10          1              6       2 malignant
## 130           1          1              1       1    benign
## 131           1          2              1       1    benign
## 132           1          3              1       1    benign
## 133          10          3              6       3 malignant
## 134           1          2              2       1    benign
## 135           1          2              1       1    benign
## 136           2          3              3       1    benign
## 137           1          2              1       1    benign
## 138           1          1              1       1    benign
```

```
## 139           1           2               1       1    benign
## 140        <NA>           2               1       1    benign
## 141           1           1               1       1    benign
## 142           1           1               1       1    benign
## 143           5           4               3       3 malignant
## 144           5           1               1       1    benign
## 145           1           2               1       1    benign
## 146        <NA>           2               1       1    benign
## 147           8           4               1       1 malignant
## 148           2           2               1       1    benign
## 149           1           5               8       1    benign
## 150          10           7               8       7 malignant
## 151           1           3               1       1    benign
## 152          10           5               4       3 malignant
## 153           5           8              10       1 malignant
## 154           3           1               1       1    benign
## 155           1           1               1       1    benign
## 156          10           3               1       1 malignant
## 157           1           2               1       1    benign
## 158           1           3               1       1    benign
## 159        <NA>           1               1       1    benign
## 160          10           7              10       6 malignant
## 161          10           5               7       2 malignant
## 162           1           3               2       1    benign
## 163           1           3               1       1    benign
## 164           3           1               1       7    benign
## 165        <NA>           3               1       1    benign
## 166           2           3               2       1    benign
## 167          10           3              10       3 malignant
## 168           1           3               1      10 malignant
## 169           1           3               1       1    benign
## 170           1           1               1       1    benign
## 171           1           1               1       1    benign
## 172           1           3               1       1    benign
## 173           1           2               1       1    benign
## 174          10          10              10       7 malignant
## 175          10           6               1       1 malignant
## 176          10           5               7       1 malignant
## 177           1           3               1       1    benign
## 178           1           5              10       3 malignant
## 179           1           3               1       1    benign
## 180          10           3               1       1 malignant
## 181           1           3               1       1    benign
## 182           1           1               1       1    benign
## 183           1           3               1       1    benign
## 184          10           7               8       1 malignant
## 185          10           5               1       1 malignant
## 186           1           3               1       1    benign
## 187           8           7              10       1 malignant
## 188          10           7               7      10 malignant
## 189           8           9              10       1 malignant
## 190           1           3               1       1    benign
## 191           8           7              10       1 malignant
## 192          10           4              10       3 malignant
```

```
## 193          1         2            1      1    benign
## 194          1         3            1      1    benign
## 195          1         3            1      1    benign
## 196          1         3            1      1    benign
## 197          7         7            8      2    benign
## 198          1         3            1      1    benign
## 199          1         1            1      1    benign
## 200          1         2            1      1    benign
## 201         10         7            8      3 malignant
## 202         10         8            1      1 malignant
## 203          1         3            1      1    benign
## 204          1         3            1      1    benign
## 205          1         3            1      1    benign
## 206         10         7           10      5 malignant
## 207          5         3            5      1 malignant
## 208          1         3            1      1    benign
## 209          1         3            1      1    benign
## 210          1         3            1      1    benign
## 211         10         8           10      6 malignant
## 212          8         7            7      1 malignant
## 213          1         3            1      1    benign
## 214         10         7           10      4 malignant
## 215         10        10            6      1 malignant
## 216          5         5           10      2 malignant
## 217          1         2            1      1    benign
## 218          1         3            1      1    benign
## 219          4         8           10      2 malignant
## 220          1         3            1      1    benign
## 221          1         3            1      1    benign
## 222         10         9           10      1 malignant
## 223          5         2            1      1 malignant
## 224          8         7            4      1 malignant
## 225         10         7            9      2 malignant
## 226          1         2            1      1    benign
## 227         10         8            9      1 malignant
## 228          5         7            7      1 malignant
## 229          1         3            1      1    benign
## 230         10         9           10      1 malignant
## 231          7         7            6      1 malignant
## 232          8         8            9      2 malignant
## 233          1         4            3      1    benign
## 234         10         4            1      1 malignant
## 235          1         3            6      1    benign
## 236       <NA>         3            1      1    benign
## 237         10         4            8     10 malignant
## 238          2         4           10      4 malignant
## 239          9         3           10     10 malignant
## 240         10         5            3      2 malignant
## 241          2         2            3      1    benign
## 242          1         3            1      1    benign
## 243          1         3            1      1    benign
## 244          5         5            1      1    benign
## 245          1         3            1      1    benign
## 246          2         3            1      1    benign
```

```
## 247          10         7             8      1 malignant
## 248           9         3             3      1 malignant
## 249           1         3             6      1    benign
## 250        <NA>         3             1      1    benign
## 251           1         1             1      1    benign
## 252          10         5             3      3 malignant
## 253          10         3             5      3    benign
## 254          10         7             3      3 malignant
## 255           8         3             3      1 malignant
## 256          10         3             6      1 malignant
## 257           1         1             1      1    benign
## 258           1         2             1      1    benign
## 259           1         3             1      1    benign
## 260           8         3             4      1    benign
## 261          10         5             1      3 malignant
## 262          10        10             6      5 malignant
## 263          10         7             8      1 malignant
## 264          10         5             5      1 malignant
## 265           3         5             3      3 malignant
## 266           1         3             2      1    benign
## 267          10         4             3      2 malignant
## 268          10         7             1      1 malignant
## 269           4         8             7      8 malignant
## 270           1         3             1      1    benign
## 271          10         3             9      2 malignant
## 272           1         3             1      1    benign
## 273          10         7             1      1 malignant
## 274           4         3             3      1 malignant
## 275           1         3             2      1    benign
## 276        <NA>         2             1      1    benign
## 277           1         2             1      1    benign
## 278           1         2             1      1    benign
## 279           1         3             1      1    benign
## 280           7         3             3      8 malignant
## 281           1         3             1      1    benign
## 282           1         3             1      1    benign
## 283          10         5             6      1 malignant
## 284          10         5             3      1 malignant
## 285          10         3             8      2 malignant
## 286          10        10             7      3 malignant
## 287          10         4            10     10 malignant
## 288           1         2             1      1    benign
## 289           5         5            10      1 malignant
## 290          10         4            10      4 malignant
## 291           1         1             1      1    benign
## 292           1         3             1      1    benign
## 293        <NA>         6            10      1 malignant
## 294          10         2             3      1 malignant
## 295        <NA>         2             1      1    benign
## 296          10         7             4      1 malignant
## 297           5         4             7      1    benign
## 298        <NA>         2             3      1    benign
## 299           1         1             1      1    benign
## 300          10         7             7      2 malignant
```

```
## 301            4           7             10       1 malignant
## 302            1           3              1       1    benign
## 303           10           7             10      10 malignant
## 304            1           3              1       1    benign
## 305           10           3              3       1 malignant
## 306           10           3             10       4 malignant
## 307            1           3              1       1    benign
## 308            1           3              1       1    benign
## 309            3           8              8       4 malignant
## 310            5           5              1       1    benign
## 311            1           2              1       1    benign
## 312            1           1              1       1    benign
## 313            1           3              5       1 malignant
## 314            1           1              1       1    benign
## 315            1           2              1       1    benign
## 316         <NA>           4              9       1    benign
## 317           10           4              3       1 malignant
## 318            8           8              9       1 malignant
## 319            1           3              1       1    benign
## 320            5           7              3       1    benign
## 321           10           7              4       6 malignant
## 322         <NA>           3              1       1    benign
## 323            1           3              1       1    benign
## 324           10           4              1       1 malignant
## 325            1           3              1       1    benign
## 326            1           2              3       1    benign
## 327           10           5              4       1 malignant
## 328            1           2              1       1    benign
## 329            4           3             10       1 malignant
## 330           10           7              1       1 malignant
## 331            8           6              1       1 malignant
## 332            1           3              1       2    benign
## 333            1           2              2       1    benign
## 334           10           4              3       1 malignant
## 335           10           3              4       2 malignant
## 336            1           1              1       1    benign
## 337           10           3              4       1 malignant
## 338            1           3              1       1    benign
## 339            1           2              1       1    benign
## 340           10           4              3       1 malignant
## 341           10           7              6       1 malignant
## 342            1           3              1       1    benign
## 343            1           1              1       1    benign
## 344            1           1              1       1    benign
## 345           10           9              5       3 malignant
## 346            1           1              1       1    benign
## 347            1           1              3       1    benign
## 348            1           1              3       1    benign
## 349            1           3              3       1 malignant
## 350            8           7              6       1 malignant
## 351            1           1              1       1    benign
## 352            1           3              1       1    benign
## 353            3           4              6       1    benign
## 354           10           4              9       4 malignant
```

```
## 355            1            2               1       1    benign
## 356            1            2               2       1    benign
## 357            3            3               3       3 malignant
## 358           10            7               3       8 malignant
## 359            4            4              10       3 malignant
## 360            7            3               5       3 malignant
## 361           10            8              10      10 malignant
## 362           10            5               1       4 malignant
## 363            3            2               1       1    benign
## 364            3            2               1       1    benign
## 365            1            3               1       1    benign
## 366            1            2               1       1    benign
## 367           10            7              10       7 malignant
## 368           10            8              10       3 malignant
## 369            1            1               1       1    benign
## 370            1            2               1       1    benign
## 371            1            2               1       1    benign
## 372            1            1               1       1    benign
## 373            1            2               1       1    benign
## 374            1            2               1       1    benign
## 375            1            2               1       1    benign
## 376            1            1               1       1    benign
## 377            1            2               1       1    benign
## 378            1            2               1       1    benign
## 379            1            2               2       1    benign
## 380            1            3               1       1    benign
## 381            1            1               1       1    benign
## 382           10            7               8       4 malignant
## 383            1            3               2       1    benign
## 384            1            1               1       1    benign
## 385            1            1               1       1    benign
## 386            1            1               2       3    benign
## 387           10            7               1       1 malignant
## 388            1            3               1       1    benign
## 389            1            2               2       1    benign
## 390            2            2               2       1    benign
## 391            1            2               1       1    benign
## 392           10            7               9       1 malignant
## 393            1            2               1       1    benign
## 394            1            1               1       1    benign
## 395            1            2               1       1    benign
## 396            1            2               1       1    benign
## 397            1            3               1       1    benign
## 398            1            1               1       1    benign
## 399            1            2               2       1    benign
## 400            1            1               1       1    benign
## 401            9            9               3       8 malignant
## 402            1            1               1       1    benign
## 403            1            2               1       1    benign
## 404            4            1               1       1    benign
## 405            1            1               2       1    benign
## 406            1            2               1       1    benign
## 407            1            2               1       1    benign
## 408            1            2               1       1    benign
```

```
## 409           2           3               1       1    benign
## 410           1           2               1       1    benign
## 411           1           2               1       1    benign
## 412        <NA>           2               1       1    benign
## 413           4           8               5       1 malignant
## 414           1           3               1       1    benign
## 415          10           6               6       1 malignant
## 416           3           3               5       1    benign
## 417          10           7               2       1 malignant
## 418           1           2               1       1    benign
## 419           2           3               2       2    benign
## 420           1           1               1       1    benign
## 421           3           3               1       1    benign
## 422          10           8               2       1 malignant
## 423           1           3               3       1    benign
## 424           1           2               1       1    benign
## 425           1           1               1       1    benign
## 426          10          10              10       1 malignant
## 427           1           1               1       1    benign
## 428           2           5              10       1 malignant
## 429           1           2               1       1    benign
## 430           1           2               1       1    benign
## 431           1           2               2       1    benign
## 432           1           3               2       1    benign
## 433           1           2               2       1    benign
## 434           1           1               1       1    benign
## 435           8           4               2       1    benign
## 436          10           5               1       1 malignant
## 437           1           2               8       1 malignant
## 438           1           1               1       1    benign
## 439           1           1               1       1    benign
## 440           1           1               1       1    benign
## 441          10          10               1       1 malignant
## 442           4           1               1       1    benign
## 443           3           1               1       1    benign
## 444           2           1               1       1    benign
## 445           1           2               1       1    benign
## 446           1           1               1       1    benign
## 447           1           1               1       1    benign
## 448           1           1               1       1    benign
## 449           1           1               1       1    benign
## 450          10           8              10       1 malignant
## 451           1           2               1       1    benign
## 452           1           1               1       1    benign
## 453           1           1               1       1    benign
## 454          10          10               7       1 malignant
## 455           1           1               1       1    benign
## 456           6           1               1       2 malignant
## 457          10           8               6       1 malignant
## 458           3          10              10       1 malignant
## 459           1           1               1       1    benign
## 460           1           1               1       1    benign
## 461           1           1               1       1    benign
## 462           5           1               1       1    benign
```

```
## 463          1          1               1      1    benign
## 464          1          1               2      1    benign
## 465          1          1               1      1    benign
## 466          4          7              10      3 malignant
## 467         10          9               7      1 malignant
## 468         10          7               6      2 malignant
## 469          1          1               1      1    benign
## 470          1          2               1      1    benign
## 471          1          2               1      1    benign
## 472          1          1               1      1    benign
## 473          1          1               1      1    benign
## 474          1          1               1      1    benign
## 475          1          1               1      1    benign
## 476          1          1               1      1    benign
## 477          1          1               1      1    benign
## 478          1          1               1      1    benign
## 479          1          1               1      1    benign
## 480         10          7               5      1 malignant
## 481          1          1               1      1    benign
## 482          1          1               1      1    benign
## 483          5         10              10     10 malignant
## 484         10          9              10      1 malignant
## 485          1          1               1      1    benign
## 486          3          1               1      1    benign
## 487          1          2               1      1    benign
## 488         10          8               1      5 malignant
## 489          3          3               4      1 malignant
## 490          4          4               1      1 malignant
## 491          1          1               1      1    benign
## 492         10          7               1      1 malignant
## 493          1          2               1      1    benign
## 494         10          6               5      2 malignant
## 495          5          2               1      1    benign
## 496          1          2               1      1    benign
## 497          1          1               1      1    benign
## 498          1          1               1      1    benign
## 499          1          2               1      1    benign
## 500          1          2               1      1    benign
## 501          1          3               1      1    benign
## 502          1          2               1      1    benign
## 503          1          2               1      1    benign
## 504          1          3               1      1    benign
## 505          1          1               1      1    benign
## 506          1          1               1      1    benign
## 507          5          4               8      7 malignant
## 508          4          1               1      1    benign
## 509          1          1               1      1    benign
## 510          1          1               1      1    benign
## 511          1          1               1      1    benign
## 512          1          2               1      1    benign
## 513          1          1               1      1    benign
## 514          1          2               1      1    benign
## 515         10          8              10      2 malignant
## 516         10          9              10      1 malignant
```

```
## 517            1            1                 1        1    benign
## 518            1            2                 1        1    benign
## 519            1            1                 1        1    benign
## 520           10            9                 1        1 malignant
## 521            1            1                 1        1    benign
## 522            1            1                 1        1    benign
## 523            5            7                 3        1 malignant
## 524           10            5                 3        1 malignant
## 525            1            2                 1        1    benign
## 526            1            1                 1        1    benign
## 527            1            1                 1        1    benign
## 528            1            3                 1        1    benign
## 529            1            1                 1        1    benign
## 530            1            2                 1        1    benign
## 531           10            6                 9        1 malignant
## 532            1            2                 1        1    benign
## 533            1            3                 1        1    benign
## 534            1            2                 1        1    benign
## 535            1            2                 1        1    benign
## 536            1            3                 1        1    benign
## 537            1            3                 1        1    benign
## 538            1            3                 1        1    benign
## 539            1            2                 1        1    benign
## 540            1            2                 1        1    benign
## 541            2            2                 1        1    benign
## 542            1            1                 1        1    benign
## 543            1            1                 1        1    benign
## 544            1            2                 1        1    benign
## 545            1            2                 1        1    benign
## 546            1            2                 1        1    benign
## 547           10            7                10        1 malignant
## 548            1            1                 1        1    benign
## 549            1            1                 1        1    benign
## 550            5            7                 8        2 malignant
## 551            1            2                 1        1    benign
## 552            1            3                 1        1    benign
## 553            1            4                 2        1    benign
## 554            5            2                 1        2    benign
## 555            1            1                 1        1    benign
## 556            1            4                 8        1    benign
## 557            1            2                 1        1    benign
## 558            1            1                 1        1    benign
## 559            1            2                 1        1    benign
## 560            1            2                 1        1    benign
## 561            1            3                 1        1    benign
## 562            1            3                 1        1    benign
## 563            1            3                 1        1    benign
## 564            1            2                 1        1    benign
## 565            1            3                 2        1    benign
## 566           10           10                10        1 malignant
## 567            1            3                 1        1    benign
## 568            3            2                 1        1    benign
## 569           10            2                 5        2 malignant
## 570            5           10                 3        1 malignant
```

```
## 571           10          8                 2       1 malignant
## 572           10          9                10       2 malignant
## 573            1          2                 1       1    benign
## 574            1          2                 1       1    benign
## 575            2          7                 7       1 malignant
## 576            1          3                 1       1    benign
## 577            1          2                 1       1    benign
## 578            1          2                 1       1    benign
## 579            1          2                 1       1    benign
## 580            1          3                 1       1    benign
## 581            1          2                 1       1    benign
## 582           10          7                 5       1 malignant
## 583           10          6                10       1 malignant
## 584            1          1                 1       1    benign
## 585            1          1                 1       1    benign
## 586            1          1                 1       1    benign
## 587           10         10                10       1 malignant
## 588            1          2                 2       1    benign
## 589            3          4                 1       1 malignant
## 590            1          1                 1       1    benign
## 591            1         10                 1       1 malignant
## 592           10          7                 6       1 malignant
## 593           10          4                 1       1 malignant
## 594            1          1                 1       1    benign
## 595           10          7                 1       1 malignant
## 596            1          2                 1       1    benign
## 597            1          2                 1       1    benign
## 598            1          3                 1       1    benign
## 599            1          2                 1       1    benign
## 600            1          1                 1       1    benign
## 601            1          2                 1       1    benign
## 602            1          2                 1       1    benign
## 603            1          2                 1       1    benign
## 604            1          8                10       1 malignant
## 605           10          8                 1       2 malignant
## 606            8          7                 8       3 malignant
## 607            1          1                 1       1    benign
## 608            1          1                 1       1    benign
## 609           10         10                 1       1 malignant
## 610            1          1                 1       1    benign
## 611           10          7                 1       2 malignant
## 612            2          8                 5       1 malignant
## 613           10         10                10      10 malignant
## 614            1          2                 1       1    benign
## 615            1          2                 1       1    benign
## 616            1          2                 1       1    benign
## 617            1          2                 1       1    benign
## 618         <NA>          1                 1       1    benign
## 619            1          2                 1       1    benign
## 620            1          2                 1       1    benign
## 621            1          2                 1       1    benign
## 622            2          6                 1       1    benign
## 623            1          2                 1       1    benign
## 624            1          1                 1       1    benign
```

```
## 625            1          2                 1       1    benign
## 626            4          1                 1       1    benign
## 627            6          7                 7       3 malignant
## 628            5          1                 1       1    benign
## 629            1          1                 1       1    benign
## 630            1          1                 1       1    benign
## 631            1          1                 1       1    benign
## 632            1          2                 1       1    benign
## 633            1          1                 1       1    benign
## 634            3          5                10       1 malignant
## 635            1          1                 1       1    benign
## 636            1          1                 1       1    benign
## 637            1         10                10       3 malignant
## 638            2          2                 1       1    benign
## 639            1          1                 1       1    benign
## 640            1          1                 1       1    benign
## 641            1          1                 1       1    benign
## 642            1          2                 1       1    benign
## 643            1          2                 1       1    benign
## 644            1          1                 1       1    benign
## 645            1          1                 1       1    benign
## 646            1          2                 1       1    benign
## 647            1          1                 1       1    benign
## 648            1          1                 1       1    benign
## 649            2         10                10      10 malignant
## 650            1          2                 1       1    benign
## 651            4          1                 1       1    benign
## 652            1          2                 1       1    benign
## 653            1          2                 2       1    benign
## 654            1          2                 1       1    benign
## 655            1          3                 1       1    benign
## 656            1          2                 1       1    benign
## 657            1          2                 1       1    benign
## 658            1          3                 6       1    benign
## 659           10          7                 2       3 malignant
## 660            1          1                 1       1    benign
## 661            1          2                 1       1    benign
## 662            1          3                 1       1    benign
## 663            1          2                 1       1    benign
## 664            1          2                 1       1    benign
## 665            1          2                 1       1    benign
## 666            1          1                 1       1    benign
## 667            1          1                 1       2    benign
## 668            1          3                 1       1    benign
## 669            1          7                10       3 malignant
## 670            5          7                10       1 malignant
## 671            8          7                 4       1 malignant
## 672            1          3                 1       1    benign
## 673            1          3                 1       1    benign
## 674            1          1                 1       1    benign
## 675            1          2                 1       1    benign
## 676            1          1                 1       1    benign
## 677            1          2                 1       1    benign
## 678            1          1                 1       1    benign
```

```
## 679           1           1               1       1    benign
## 680           1           1               1       1    benign
## 681          10          10              10       7 malignant
## 682          10           5               6       3 malignant
## 683           1           3               2       1    benign
## 684           1           1               1       1    benign
## 685           1           1               1       1    benign
## 686           1           1               1       1    benign
## 687           1           1               1       1    benign
## 688           1           2               3       1    benign
## 689           1           1               1       1    benign
## 690           1           1               1       8    benign
## 691           1           1               1       1    benign
## 692           5           4               4       1 malignant
## 693           1           1               1       1    benign
## 694           1           2               1       2    benign
## 695           2           1               1       1    benign
## 696           1           1               1       1    benign
## 697           3           8              10       2 malignant
## 698           4          10               6       1 malignant
## 699           5          10               4       1 malignant
```

a. describe what is the dataset all about.

```
# According to r-project.org,The data were reported by Dr: Wolberg on the basis on his
# clinical cases in studying breast cancer: The objective is to identify each of a number of benign or 
```

b. Import the data from MS Excel. Copy the codes.

```
Breast_cancer_xlsx <- read_excel("/cloud/project/RWorksheet_JACULINA#7a/DATA_BREAST_CANCER.xlsx")
Breast_cancer_xlsx
```

```
## # A tibble: 49 x 11
##          Id CL. thickne~1 Cell ~2 Cell ~3 Marg.~4 Epith~5 Bare.~6 Bl. C~7 Norma~8
##       <dbl>         <dbl>   <dbl>   <dbl>   <dbl>   <dbl> <chr>     <dbl>   <dbl>
##  1 1000025              5       1       1       1       2 1             3       1
##  2 1002945              5       4       4       5       7 10            3       2
##  3 1015425              3       1       1       1       2 2             3       1
##  4 1016277              6       8       8       1       3 4             3       7
##  5 1017023              4       1       1       3       2 1             3       1
##  6 1017122              8      10      10       8       7 10            9       7
##  7 1018099              1       1       1       1       2 10            3       1
##  8 1018561              2       1       2       1       2 1             3       1
##  9 1033078              2       1       1       1       2 1             1       1
## 10 1033078              4       2       1       1       2 1             2       1
## # ... with 39 more rows, 2 more variables: Mitoses <dbl>, Class <chr>, and
## #   abbreviated variable names 1: `CL. thickness`, 2: `Cell size`,
## #   3: `Cell Shape`, 4: `Marg. Adhesion`, 5: `Epith. C.size`,
## #   6: `Bare. Nuclei`, 7: `Bl. Cromatin`, 8: `Normal nucleoli`
```

c. Compute the descriptive statistics using different packages. Find the values of:

c.1 Standard error of the mean for clump thickness.

```
Standard_error <- function(x) sd(x)/sqrt(length(x))
SE_clump <- Standard_error(Breast_cancer_xlsx$`CL. thickness`)
SE_clump
```

```
## [1] 0.4092884
```

c.2 Coefficient of variability for Marginal Adhesion.

```
coe_var <- sd(Breast_cancer_xlsx$`Marg. Adhesion`) / mean(Breast_cancer_xlsx$`Marg. Adhesion`) * 100
coe_var
```

```
## [1] 97.67235
```

c.3 Number of null values of Bare Nuclei.

```
null_values1 <- sum(is.na(Breast_cancer_xlsx$`Bare. Nuclei`))
null_values1
```

```
## [1] 0
```

```
# It has 2 NA but the given codes that I input resulted to zero (0) so instead I tried to used the subs
null_values2 <- subset(Breast_cancer_xlsx,`Bare. Nuclei` == "NA")
null_values2
```

```
## # A tibble: 2 x 11
##        Id CL. t~1 Cell ~2 Cell ~3 Marg.~4 Epith~5 Bare.~6 Bl. C~7 Norma~8 Mitoses
##     <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl> <chr>     <dbl>   <dbl>   <dbl>
## 1 1.06e6       8       4       5       1       2 NA            7       3       1
## 2 1.10e6       6       6       6       9       6 NA            7       8       1
## # ... with 1 more variable: Class <chr>, and abbreviated variable names
## #   1: `CL. thickness`, 2: `Cell size`, 3: `Cell Shape`, 4: `Marg. Adhesion`,
## #   5: `Epith. C.size`, 6: `Bare. Nuclei`, 7: `Bl. Cromatin`,
## #   8: `Normal nucleoli`
```

c.4 Mean and standard deviation for Bland Chromatin

```
mean_BlandChromatin <- mean(Breast_cancer_xlsx$`Bl. Cromatin`)
mean_BlandChromatin
```

```
## [1] 3.836735
```

```
sd_BlandChromatin <- sd(Breast_cancer_xlsx$`Bl. Cromatin`)
sd_BlandChromatin
```

```
## [1] 2.085135
```

c.5 Confidence interval of the mean for Uniformity of Cell Shape

```
Confi.mean <- mean(Breast_cancer_xlsx$`Cell Shape`)
Confi.mean
```

```
## [1] 3.163265
```

```r
Confi.n <- length(Breast_cancer_xlsx$`Cell Shape`)
Confi.sd <- sd(Breast_cancer_xlsx$`Cell Shape`)
Confi.se <- Confi.sd/sqrt(Confi.n)
Confi.se
```

```
## [1] 0.4158294
```

```r
alpha = 0.05
degrees.freedom = Confi.n - 1
t.score = qt(p=alpha/2, df=degrees.freedom,lower.tail=F)
t.score
```

```
## [1] 2.010635
```

```r
margin.error <- t.score * Confi.se
lower.bound <- Confi.mean - margin.error
upper.bound <- Confi.mean + margin.error
print(c(lower.bound,upper.bound))
```

```
## [1] 2.327184 3.999346
```

d. How many attributes?

```r
attributes_BC <- attributes(Breast_cancer_xlsx)
attributes_BC
```

```
## $class
## [1] "tbl_df"     "tbl"        "data.frame"
##
## $row.names
##  [1]  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25
## [26] 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
##
## $names
##  [1] "Id"               "CL. thickness"   "Cell size"       "Cell Shape"
##  [5] "Marg. Adhesion"   "Epith. C.size"   "Bare. Nuclei"    "Bl. Cromatin"
##  [9] "Normal nucleoli" "Mitoses"         "Class"
```

```r
# It has 3 attributes, It shows the class, row.names, and names.
```

e. Find the percentage of respondents who are malignant. Interpret the results.

```r
malignant1 <- subset(Breast_cancer_xlsx[c(1:49), c(11)])
malignant1
```

```
## # A tibble: 49 x 1
##    Class
##    <chr>
##  1 benign
##  2 benign
##  3 benign
##  4 benign
##  5 benign
##  6 malignant
##  7 benign
##  8 benign
```

```
##  9 benign
## 10 benign
## # ... with 39 more rows
```

```
pos.malignant <- subset(Breast_cancer_xlsx, Class == 'malignant')
pos.malignant
```

```
## # A tibble: 1 x 11
##        Id CL. t~1 Cell ~2 Cell ~3 Marg.~4 Epith~5 Bare.~6 Bl. C~7 Norma~8 Mitoses
##     <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl> <chr>     <dbl>   <dbl>   <dbl>
## 1 1.02e6       8      10      10       8       7 10            9       7       1
## # ... with 1 more variable: Class <chr>, and abbreviated variable names
## #   1: `CL. thickness`, 2: `Cell size`, 3: `Cell Shape`, 4: `Marg. Adhesion`,
## #   5: `Epith. C.size`, 6: `Bare. Nuclei`, 7: `Bl. Cromatin`,
## #   8: `Normal nucleoli`
```

```
# Percentage
malignant <- 17  / 49 * 100
malignant
```

```
## [1] 34.69388
```

```
# We can conclude that the data of were reported by Dr: Wolberg on the basis on his
# clinical cases in studying breast cancer
# Out of 47 respondents, there are 17 respondents who are malignant with corresponding of 34.69388 perc
```

9. Export the data abalone to the Microsoft excel file. Copy the codes.

```
install.packages("AppliedPredictiveModeling")
```

```
## Installing package into '/cloud/lib/x86_64-pc-linux-gnu-library/4.2'
## (as 'lib' is unspecified)
```

```
library("AppliedPredictiveModeling")
data(abalone)
# View(abalone)
head(abalone)
```

```
##   Type LongestShell Diameter Height WholeWeight ShuckedWeight VisceraWeight
## 1    M        0.455    0.365  0.095      0.5140        0.2245        0.1010
## 2    M        0.350    0.265  0.090      0.2255        0.0995        0.0485
## 3    F        0.530    0.420  0.135      0.6770        0.2565        0.1415
## 4    M        0.440    0.365  0.125      0.5160        0.2155        0.1140
## 5    I        0.330    0.255  0.080      0.2050        0.0895        0.0395
## 6    I        0.425    0.300  0.095      0.3515        0.1410        0.0775
##   ShellWeight Rings
## 1       0.150    15
## 2       0.070     7
## 3       0.210     9
## 4       0.155    10
## 5       0.055     7
## 6       0.120     8
```

```
summary(abalone)
```

```
##  Type      LongestShell      Diameter          Height        WholeWeight
##  F:1307   Min.   :0.075   Min.   :0.0550   Min.   :0.0000   Min.   :0.0020
```

```
##  I:1342   1st Qu.:0.450   1st Qu.:0.3500   1st Qu.:0.1150   1st Qu.:0.4415
##  M:1528   Median :0.545   Median :0.4250   Median :0.1400   Median :0.7995
##           Mean   :0.524   Mean   :0.4079   Mean   :0.1395   Mean   :0.8287
##           3rd Qu.:0.615   3rd Qu.:0.4800   3rd Qu.:0.1650   3rd Qu.:1.1530
##           Max.   :0.815   Max.   :0.6500   Max.   :1.1300   Max.   :2.8255
##  ShuckedWeight    VisceraWeight     ShellWeight         Rings
##  Min.   :0.0010   Min.   :0.0005   Min.   :0.0015   Min.   : 1.000
##  1st Qu.:0.1860   1st Qu.:0.0935   1st Qu.:0.1300   1st Qu.: 8.000
##  Median :0.3360   Median :0.1710   Median :0.2340   Median : 9.000
##  Mean   :0.3594   Mean   :0.1806   Mean   :0.2388   Mean   : 9.934
##  3rd Qu.:0.5020   3rd Qu.:0.2530   3rd Qu.:0.3290   3rd Qu.:11.000
##  Max.   :1.4880   Max.   :0.7600   Max.   :1.0050   Max.   :29.000
```

```r
write.xlsx(abalone, "abalone.xlsx")
```