Worksheet #6

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1. Create a data frame for the table below. Show your solution.

```
students_data <- data.frame (
  Students = c(1,2,3,4,5,6,7,8,9,10),
  preTest =  c(55,54,47,57,51,61,57,54,63,58),
  postTest = c(61,60,56,63,56,63,59,56,62,61)
)

students_data

##    Students preTest postTest
## 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

```
library(Hmisc)

## Warning: package 'Hmisc' was built under R version 4.3.2

##
## Attaching package: 'Hmisc'

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

library(pastecs)

## Warning: package 'pastecs' was built under R version 4.3.2

hmiscSTATS<-describe(students_data)
pasticsSTATS <- stat.desc(students_data)

hmiscSTATS
```

```
## students_data
##
##  3  Variables      10  Observations
## ---------------------------------------------------------------------------
------
## Students
##        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
##
## 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
##
## For the frequency table, variable is rounded to the nearest 0
## ---------------------------------------------------------------------------
------
## preTest
##        n  missing distinct     Info     Mean      Gmd
##       10        0        8    0.988     55.7    5.444
##
## 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
##
## For the frequency table, variable is rounded to the nearest 0
## ---------------------------------------------------------------------------
------
## postTest
##        n  missing distinct     Info     Mean      Gmd
##       10        0        6    0.964     59.7    3.311
##
## 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
##
## For the frequency table, variable is rounded to the nearest 0
## ---------------------------------------------------------------------------
------
```

pasticsSTATS

```
##                 Students      preTest     postTest
## 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.

#a. Write the codes and describe the result.

```
fertilizer <- c(10,10,10, 20,20,50,10,20,10,50,20,50,20,10)
ordered(fertilizer)

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

The data_fertilize result displays the level as an ordered factor.

#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?

```
exercise_levels <- c("l", "n", "n", "i", "l", "l", "n", "n", "i", "l")
exercise_factor <- factor(exercise_levels, levels = c("n", "l", "i"), labels
= c("none", "light", "intense"))
exercise_factor

##  [1] light   none    none    intense light   light   none    none    
intense
## [10] light
## Levels: none light intense
```

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")

factorlevel <-factor(state, levels = c("act", "nsw", "nt", "qld", "sa",
```

```
"tas", "vic", "wa") )
factorlevel

##  [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
```

5. From #4 - continuation:

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

```
income <- 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)
```

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

```
income_means <- tapply(income, factorlevel, mean)

income_means

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

b. Copy the results and interpret.

#The result has the means of each states that has factor with levels # act nsw nt qld sa tas vic wa #50000 57.33333 55.50000 53.60000 55.00000 60.50000 56.00000 52.25000

#The data suggests that there are variations in mean incomes for tax accountants across different states in Australia, with NSW and Tasmania having higher average incomes compared to other states.

#6. Calculate the standard errors of the state income means (refer again to number 3) #stdError <- function(x) sqrt(var(x)/length(x)) Note: After this assignment, the standard errors are calculated by: incster <- tapply(incomes, statef, stdError)

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

```
stdError <- function(x) sqrt(var(x)/length(x))
incster <- tapply(income, factorlevel, 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 precision and diversity of the mean income calculations for each state are shown by the standard errors. Greater unpredictability and less precision are typically indicated by higher standard errors, whereas lower standard errors typically indicate more precise estimations. For a thorough analysis of the data, these standard errors must be taken into account in addition to the mean incomes.

#7. Use the titanic dataset.

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

```
library(datasets)
data(Titanic)

titanic <- as.data.frame(Titanic)

survived <- subset(titanic, Survived == "Yes")
print(survived)

##    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

did_not_survive <- subset(titanic, Survived == "No")
print(did_not_survive)

##    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 chronologihttps://drive.google.com/file/d/16MFLoehCgx2MJuNSAuB2CsBy6eDIIru/view?usp=drive_link)

```
library(readr)
csv.file<-"breastcancer_wisconsin.csv"
breastcancer<-read.csv("breastcancer_wisconsin.csv")
breastcancer
```

```
##            id clump_thickness size_uniformity shape_uniformity
marginal_adhesion
## 1    1000025               5               1                1
1
## 2    1002945               5               4                4
5
## 3    1015425               3               1                1
1
## 4    1016277               6               8                8
1
## 5    1017023               4               1                1
3
## 6    1017122               8              10               10
8
## 7    1018099               1               1                1
1
## 8    1018561               2               1                2
1
## 9    1033078               2               1                1
1
## 10   1033078               4               2                1
1
## 11   1035283               1               1                1
1
## 12   1036172               2               1                1
1
## 13   1041801               5               3                3
3
## 14   1043999               1               1                1
1
```

```
## 15   1044572              8               7               5
10
## 16   1047630              7               4               6
4
## 17   1048672              4               1               1
1
## 18   1049815              4               1               1
1
## 19   1050670             10               7               7
6
## 20   1050718              6               1               1
1
## 21   1054590              7               3               2
10
## 22   1054593             10               5               5
3
## 23   1056784              3               1               1
1
## 24   1057013              8               4               5
1
## 25   1059552              1               1               1
1
## 26   1065726              5               2               3
4
## 27   1066373              3               2               1
1
## 28   1066979              5               1               1
1
## 29   1067444              2               1               1
1
## 30   1070935              1               1               3
1
## 31   1070935              3               1               1
1
## 32   1071760              2               1               1
1
## 33   1072179             10               7               7
3
## 34   1074610              2               1               1
2
## 35   1075123              3               1               2
1
## 36   1079304              2               1               1
1
## 37   1080185             10              10              10
8
## 38   1081791              6               2               1
1
## 39   1084584              5               4               4
9
```

```
## 40   1091262             2             5              3
3
## 41   1096800             6             6              6
9
## 42   1099510            10             4              3
1
## 43   1100524             6            10             10
2
## 44   1102573             5             6              5
6
## 45   1103608            10            10             10
4
## 46   1103722             1             1              1
1
## 47   1105257             3             7              7
4
## 48   1105524             1             1              1
1
## 49   1106095             4             1              1
3
## 50   1106829             7             8              7
2
## 51   1108370             9             5              8
1
## 52   1108449             5             3              3
4
## 53   1110102            10             3              6
2
## 54   1110503             5             5              5
8
## 55   1110524            10             5              5
6
## 56   1111249            10             6              6
3
## 57   1112209             8            10             10
1
## 58   1113038             8             2              4
1
## 59   1113483             5             2              3
1
## 60   1113906             9             5              5
2
## 61   1115282             5             3              5
5
## 62   1115293             1             1              1
1
## 63   1116116             9            10             10
1
## 64   1116132             6             3              4
1
```

```
## 65   1116192                 1               1                1
1
## 66   1116998                10               4                2
1
## 67   1117152                 4               1                1
1
## 68   1118039                 5               3                4
1
## 69   1120559                 8               3                8
3
## 70   1121732                 1               1                1
1
## 71   1121919                 5               1                3
1
## 72   1123061                 6              10                2
8
## 73   1124651                 1               3                3
2
## 74   1125035                 9               4                5
10
## 75   1126417                10               6                4
1
## 76   1131294                 1               1                2
1
## 77   1132347                 1               1                4
1
## 78   1133041                 5               3                1
2
## 79   1133136                 3               1                1
1
## 80   1136142                 2               1                1
1
## 81   1137156                 2               2                2
1
## 82   1143978                 4               1                1
2
## 83   1143978                 5               2                1
1
## 84   1147044                 3               1                1
1
## 85   1147699                 3               5                7
8
## 86   1147748                 5              10                6
1
## 87   1148278                 3               3                6
4
## 88   1148873                 3               6                6
6
## 89   1152331                 4               1                1
1
```

```
## 90   1155546               2              1              1
2
## 91   1156272               1              1              1
1
## 92   1156948               3              1              1
2
## 93   1157734               4              1              1
1
## 94   1158247               1              1              1
1
## 95   1160476               2              1              1
1
## 96   1164066               1              1              1
1
## 97   1165297               2              1              1
2
## 98   1165790               5              1              1
1
## 99   1165926               9              6              9
2
## 100  1166630               7              5              6
10
## 101  1166654              10              3              5
1
## 102  1167439               2              3              4
4
## 103  1167471               4              1              2
1
## 104  1168359               8              2              3
1
## 105  1168736              10             10             10
10
## 106  1169049               7              3              4
4
## 107  1170419              10             10             10
8
## 108  1170420               1              6              8
10
## 109  1171710               1              1              1
1
## 110  1171710               6              5              4
4
## 111  1171795               1              3              1
2
## 112  1171845               8              6              4
3
## 113  1172152              10              3              3
10
## 114  1173216              10             10             10
3
```

```
## 115  1173235              3               3                2
1
## 116  1173347              1               1                1
1
## 117  1173347              8               3                3
1
## 118  1173509              4               5                5
10
## 119  1173514              1               1                1
1
## 120  1173681              3               2                1
1
## 121  1174057              1               1                2
2
## 122  1174057              4               2                1
1
## 123  1174131             10              10               10
2
## 124  1174428              5               3                5
1
## 125  1175937              5               4                6
7
## 126  1176406              1               1                1
1
## 127  1176881              7               5                3
7
## 128  1177027              3               1                1
1
## 129  1177399              8               3                5
4
## 130  1177512              1               1                1
1
## 131  1178580              5               1                3
1
## 132  1179818              2               1                1
1
## 133  1180194              5              10                8
10
## 134  1180523              3               1                1
1
## 135  1180831              3               1                1
1
## 136  1181356              5               1                1
1
## 137  1182404              4               1                1
1
## 138  1182410              3               1                1
1
## 139  1183240              4               1                2
1
```

```
## 140  1183246              1              1              1
1
## 141  1183516              3              1              1
1
## 142  1183911              2              1              1
1
## 143  1183983              9              5              5
4
## 144  1184184              1              1              1
1
## 145  1184241              2              1              1
1
## 146  1184840              1              1              3
1
## 147  1185609              3              4              5
2
## 148  1185610              1              1              1
1
## 149  1187457              3              1              1
3
## 150  1187805              8              8              7
4
## 151  1188472              1              1              1
1
## 152  1189266              7              2              4
1
## 153  1189286             10             10              8
6
## 154  1190394              4              1              1
1
## 155  1190485              1              1              1
1
## 156  1192325              5              5              5
6
## 157  1193091              1              2              2
1
## 158  1193210              2              1              1
1
## 159  1193683              1              1              2
1
## 160  1196295              9              9             10
3
## 161  1196915             10              7              7
4
## 162  1197080              4              1              1
1
## 163  1197270              3              1              1
1
## 164  1197440              1              1              1
2
```

```
## 165  1197510              5               1                1
1
## 166  1197979              4               1                1
1
## 167  1197993              5               6                7
8
## 168  1198128             10               8               10
10
## 169  1198641              3               1                1
1
## 170  1199219              1               1                1
2
## 171  1199731              3               1                1
1
## 172  1199983              1               1                1
1
## 173  1200772              1               1                1
1
## 174  1200847              6              10               10
10
## 175  1200892              8               6                5
4
## 176  1200952              5               8                7
7
## 177  1201834              2               1                1
1
## 178  1201936              5              10               10
3
## 179  1202125              4               1                1
1
## 180  1202812              5               3                3
3
## 181  1203096              1               1                1
1
## 182  1204242              1               1                1
1
## 183  1204898              6               1                1
1
## 184  1205138              5               8                8
8
## 185  1205579              8               7                6
4
## 186  1206089              2               1                1
1
## 187  1206695              1               5                8
6
## 188  1206841             10               5                6
10
## 189  1207986              5               8                4
10
```

```
## 190  1208301              1              2              3
1
## 191  1210963             10             10             10
8
## 192  1211202              7              5             10
10
## 193  1212232              5              1              1
1
## 194  1212251              1              1              1
1
## 195  1212422              3              1              1
1
## 196  1212422              4              1              1
1
## 197  1213375              8              4              4
5
## 198  1213383              5              1              1
4
## 199  1214092              1              1              1
1
## 200  1214556              3              1              1
1
## 201  1214966              9              7              7
5
## 202  1216694             10              8              8
4
## 203  1216947              1              1              1
1
## 204  1217051              5              1              1
1
## 205  1217264              1              1              1
1
## 206  1218105              5             10             10
9
## 207  1218741             10             10              9
3
## 208  1218860              1              1              1
1
## 209  1218860              1              1              1
1
## 210  1219406              5              1              1
1
## 211  1219525              8             10             10
10
## 212  1219859              8             10              8
8
## 213  1220330              1              1              1
1
## 214  1221863             10             10             10
10
```

```
## 215  1222047              10              10               10
10
## 216  1222936               8               7                8
7
## 217  1223282               1               1                1
1
## 218  1223426               1               1                1
1
## 219  1223793               6              10                7
7
## 220  1223967               6               1                3
1
## 221  1224329               1               1                1
2
## 222  1225799              10               6                4
3
## 223  1226012               4               1                1
3
## 224  1226612               7               5                6
3
## 225  1227210              10               5                5
6
## 226  1227244               1               1                1
1
## 227  1227481              10               5                7
4
## 228  1228152               8               9                9
5
## 229  1228311               1               1                1
1
## 230  1230175              10              10               10
3
## 231  1230688               7               4                7
4
## 232  1231387               6               8                7
5
## 233  1231706               8               4                6
3
## 234  1232225              10               4                5
5
## 235  1236043               3               3                2
1
## 236  1241232               3               1                4
1
## 237  1241559              10               8                8
2
## 238  1241679               9               8                8
5
## 239  1242364               8              10               10
8
```

```
## 240  1243256                 10               4                3
2
## 241  1270479                  5               1                3
3
## 242  1276091                  3               1                1
3
## 243  1277018                  2               1                1
1
## 244   128059                  1               1                1
1
## 245  1285531                  1               1                1
1
## 246  1287775                  5               1                1
2
## 247   144888                  8              10               10
8
## 248   145447                  8               4                4
1
## 249   167528                  4               1                1
1
## 250   169356                  3               1                1
1
## 251   183913                  1               2                2
1
## 252   191250                 10               4                4
10
## 253  1017023                  6               3                3
5
## 254  1100524                  6              10               10
2
## 255  1116116                  9              10               10
1
## 256  1168736                  5               6                6
2
## 257  1182404                  3               1                1
1
## 258  1182404                  3               1                1
1
## 259  1198641                  3               1                1
1
## 260   242970                  5               7                7
1
## 261   255644                 10               5                8
10
## 262   263538                  5              10               10
6
## 263   274137                  8               8                9
4
## 264   303213                 10               4                4
10
```

```
## 265   314428                    7                9                4
10
## 266  1182404                    5                1                4
1
## 267  1198641                   10               10                6
3
## 268   320675                    3                3                5
2
## 269   324427                   10                8                8
2
## 270   385103                    1                1                1
1
## 271   390840                    8                4                7
1
## 272   411453                    5                1                1
1
## 273   320675                    3                3                5
2
## 274   428903                    7                2                4
1
## 275   431495                    3                1                1
1
## 276   432809                    3                1                3
1
## 277   434518                    3                1                1
1
## 278   452264                    1                1                1
1
## 279   456282                    1                1                1
1
## 280   476903                   10                5                7
3
## 281   486283                    3                1                1
1
## 282   486662                    2                1                1
2
## 283   488173                    1                4                3
10
## 284   492268                   10                4                6
1
## 285   508234                    7                4                5
10
## 286   527363                    8               10               10
10
## 287   529329                   10               10               10
10
## 288   535331                    3                1                1
1
## 289   543558                    6                1                3
1
```

```
## 290   555977                5                6                6
8
## 291   560680                1                1                1
1
## 292   561477                1                1                1
1
## 293   563649                8                8                8
1
## 294   601265               10                4                4
6
## 295   606140                1                1                1
1
## 296   606722                5                5                7
8
## 297   616240                5                3                4
3
## 298    61634                5                4                3
1
## 299   625201                8                2                1
1
## 300    63375                9                1                2
6
## 301   635844                8                4               10
5
## 302   636130                1                1                1
1
## 303   640744               10               10               10
7
## 304   646904                1                1                1
1
## 305   653777                8                3                4
9
## 306   659642               10                8                4
4
## 307   666090                1                1                1
1
## 308   666942                1                1                1
1
## 309   667204                7                8                7
6
## 310   673637                3                1                1
1
## 311   684955                2                1                1
1
## 312   688033                1                1                1
1
## 313   691628                8                6                4
10
## 314   693702                1                1                1
1
```

```
## 315   704097                    1               1                1
1
## 316   704168                    4               6                5
6
## 317   706426                    5               5                5
2
## 318   709287                    6               8                7
8
## 319   718641                    1               1                1
1
## 320   721482                    4               4                4
4
## 321   730881                    7               6                3
2
## 322   733639                    3               1                1
1
## 323   733639                    3               1                1
1
## 324   733823                    5               4                6
10
## 325   740492                    1               1                1
1
## 326   743348                    3               2                2
1
## 327   752904                   10               1                1
1
## 328   756136                    1               1                1
1
## 329   760001                    8              10                3
2
## 330   760239                   10               4                6
4
## 331    76389                   10               4                7
2
## 332   764974                    5               1                1
1
## 333   770066                    5               2                2
2
## 334   785208                    5               4                6
6
## 335   785615                    8               6                7
3
## 336   792744                    1               1                1
1
## 337   797327                    6               5                5
8
## 338   798429                    1               1                1
1
## 339   704097                    1               1                1
1
```

```
## 340   806423                 8               5                5
5
## 341   809912                10               3                3
1
## 342   810104                 1               1                1
1
## 343   814265                 2               1                1
1
## 344   814911                 1               1                1
1
## 345   822829                 7               6                4
8
## 346   826923                 1               1                1
1
## 347   830690                 5               2                2
2
## 348   831268                 1               1                1
1
## 349   832226                 3               4                4
10
## 350   832567                 4               2                3
5
## 351   836433                 5               1                1
3
## 352   837082                 2               1                1
1
## 353   846832                 3               4                5
3
## 354   850831                 2               7               10
10
## 355   855524                 1               1                1
1
## 356   857774                 4               1                1
1
## 357   859164                 5               3                3
1
## 358   859350                 8              10               10
7
## 359   866325                 8              10                5
3
## 360   873549                10               3                5
4
## 361   877291                 6              10               10
10
## 362   877943                 3              10                3
10
## 363   888169                 3               2                2
1
## 364   888523                 4               4                4
2
```

```
## 365   896404                 2               1                1
1
## 366   897172                 2               1                1
1
## 367    95719                 6              10               10
10
## 368   160296                 5               8                8
10
## 369   342245                 1               1                3
1
## 370   428598                 1               1                3
1
## 371   492561                 4               3                2
1
## 372   493452                 1               1                3
1
## 373   493452                 4               1                2
1
## 374   521441                 5               1                1
2
## 375   560680                 3               1                2
1
## 376   636437                 1               1                1
1
## 377   640712                 1               1                1
1
## 378   654244                 1               1                1
1
## 379   657753                 3               1                1
4
## 380   685977                 5               3                4
1
## 381   805448                 1               1                1
1
## 382   846423                10               6                3
6
## 383  1002504                 3               2                2
2
## 384  1022257                 2               1                1
1
## 385  1026122                 2               1                1
1
## 386  1071084                 3               3                2
2
## 387  1080233                 7               6                6
3
## 388  1114570                 5               3                3
2
## 389  1114570                 2               1                1
1
```

```
## 390  1116715               5               1                1
1
## 391  1131411               1               1                1
2
## 392  1151734              10               8                7
4
## 393  1156017               3               1                1
1
## 394  1158247               1               1                1
1
## 395  1158405               1               2                3
1
## 396  1168278               3               1                1
1
## 397  1176187               3               1                1
1
## 398  1196263               4               1                1
1
## 399  1196475               3               2                1
1
## 400  1206314               1               2                3
1
## 401  1211265               3              10                8
7
## 402  1213784               3               1                1
1
## 403  1223003               5               3                3
1
## 404  1223306               3               1                1
1
## 405  1223543               1               2                1
3
## 406  1229929               1               1                1
1
## 407  1231853               4               2                2
1
## 408  1234554               1               1                1
1
## 409  1236837               2               3                2
2
## 410  1237674               3               1                2
1
## 411  1238021               1               1                1
1
## 412  1238464               1               1                1
1
## 413  1238633              10              10               10
6
## 414  1238915               5               1                2
1
```

```
## 415  1238948                   8                5                6
2
## 416  1239232                   3                3                2
6
## 417  1239347                   8                7                8
5
## 418  1239967                   1                1                1
1
## 419  1240337                   5                2                2
2
## 420  1253505                   2                3                1
1
## 421  1255384                   3                2                2
3
## 422  1257200                  10               10               10
7
## 423  1257648                   4                3                3
1
## 424  1257815                   5                1                3
1
## 425  1257938                   3                1                1
1
## 426  1258549                   9               10               10
10
## 427  1258556                   5                3                6
1
## 428  1266154                   8                7                8
2
## 429  1272039                   1                1                1
1
## 430  1276091                   2                1                1
1
## 431  1276091                   1                3                1
1
## 432  1276091                   5                1                1
3
## 433  1277629                   5                1                1
1
## 434  1293439                   3                2                2
3
## 435  1293439                   6                9                7
5
## 436  1294562                  10                8               10
1
## 437  1295186                  10               10               10
1
## 438   527337                   4                1                1
1
## 439   558538                   4                1                3
3
```

```
## 440   566509                5                1                1
1
## 441   608157               10                4                3
10
## 442   677910                5                2                2
4
## 443   734111                1                1                1
3
## 444   734111                1                1                1
1
## 445   780555                5                1                1
6
## 446   827627                2                1                1
1
## 447  1049837                1                1                1
1
## 448  1058849                5                1                1
1
## 449  1182404                1                1                1
1
## 450  1193544                5                7                9
8
## 451  1201870                4                1                1
3
## 452  1202253                5                1                1
1
## 453  1227081                3                1                1
3
## 454  1230994                4                5                5
8
## 455  1238410                2                3                1
1
## 456  1246562               10                2                2
1
## 457  1257470               10                6                5
8
## 458  1259008                8                8                9
6
## 459  1266124                5                1                2
1
## 460  1267898                5                1                3
1
## 461  1268313                5                1                1
3
## 462  1268804                3                1                1
1
## 463  1276091                6                1                1
3
## 464  1280258                4                1                1
1
```

```
## 465  1293966              4               1               1
1
## 466  1296572             10               9               8
7
## 467  1298416             10               6               6
2
## 468  1299596              6               6               6
5
## 469  1105524              4               1               1
1
## 470  1181685              1               1               2
1
## 471  1211594              3               1               1
1
## 472  1238777              6               1               1
3
## 473  1257608              6               1               1
1
## 474  1269574              4               1               1
1
## 475  1277145              5               1               1
1
## 476  1287282              3               1               1
1
## 477  1296025              4               1               2
1
## 478  1296263              4               1               1
1
## 479  1296593              5               2               1
1
## 480  1299161              4               8               7
10
## 481  1301945              5               1               1
1
## 482  1302428              5               3               2
4
## 483  1318169              9              10              10
10
## 484   474162              8               7               8
5
## 485   787451              5               1               2
1
## 486  1002025              1               1               1
3
## 487  1070522              3               1               1
1
## 488  1073960             10              10              10
10
## 489  1076352              3               6               4
10
```

```
## 490  1084139              6            3            2
1
## 491  1115293              1            1            1
1
## 492  1119189              5            8            9
4
## 493  1133991              4            1            1
1
## 494  1142706              5           10           10
10
## 495  1155967              5            1            2
10
## 496  1170945              3            1            1
1
## 497  1181567              1            1            1
1
## 498  1182404              4            2            1
1
## 499  1204558              4            1            1
1
## 500  1217952              4            1            1
1
## 501  1224565              6            1            1
1
## 502  1238186              4            1            1
1
## 503  1253917              4            1            1
2
## 504  1265899              4            1            1
1
## 505  1268766              1            1            1
1
## 506  1277268              3            3            1
1
## 507  1286943              8           10           10
10
## 508  1295508              1            1            1
1
## 509  1297327              5            1            1
1
## 510  1297522              2            1            1
1
## 511  1298360              1            1            1
1
## 512  1299924              5            1            1
1
## 513  1299994              5            1            1
1
## 514  1304595              3            1            1
1
```

```
## 515  1306282                      6                6                7
10
## 516  1313325                      4               10                4
7
## 517  1320077                      1                1                1
1
## 518  1320077                      1                1                1
1
## 519  1320304                      3                1                2
2
## 520  1330439                      4                7                8
3
## 521   333093                      1                1                1
1
## 522   369565                      4                1                1
1
## 523   412300                     10                4                5
4
## 524   672113                      7                5                6
10
## 525   749653                      3                1                1
1
## 526   769612                      3                1                1
2
## 527   769612                      4                1                1
1
## 528   798429                      4                1                1
1
## 529   807657                      6                1                3
2
## 530  8233704                      4                1                1
1
## 531   837480                      7                4                4
3
## 532   867392                      4                2                2
1
## 533   869828                      1                1                1
1
## 534  1043068                      3                1                1
1
## 535  1056171                      2                1                1
1
## 536  1061990                      1                1                3
2
## 537  1113061                      5                1                1
1
## 538  1116192                      5                1                2
1
## 539  1135090                      4                1                1
1
```

```
## 540  1145420                   6                1                1
1
## 541  1158157                   5                1                1
1
## 542  1171578                   3                1                1
1
## 543  1174841                   5                3                1
1
## 544  1184586                   4                1                1
1
## 545  1186936                   2                1                3
2
## 546  1197527                   5                1                1
1
## 547  1222464                   6               10               10
10
## 548  1240603                   2                1                1
1
## 549  1240603                   3                1                1
1
## 550  1241035                   7                8                3
7
## 551  1287971                   3                1                1
1
## 552  1289391                   1                1                1
1
## 553  1299924                   3                2                2
2
## 554  1306339                   4                4                2
1
## 555  1313658                   3                1                1
1
## 556  1313982                   4                3                1
1
## 557  1321264                   5                2                2
2
## 558  1321321                   5                1                1
3
## 559  1321348                   2                1                1
1
## 560  1321931                   5                1                1
1
## 561  1321942                   5                1                1
1
## 562  1321942                   5                1                1
1
## 563  1328331                   1                1                1
1
## 564  1328755                   3                1                1
1
```

```
## 565  1331405                    4                1                1
1
## 566  1331412                    5                7               10
10
## 567  1333104                    3                1                2
1
## 568  1334071                    4                1                1
1
## 569  1343068                    8                4                4
1
## 570  1343374                   10               10                8
10
## 571  1344121                    8               10                4
4
## 572   142932                    7                6               10
5
## 573   183936                    3                1                1
1
## 574   324382                    1                1                1
1
## 575   378275                   10                9                7
3
## 576   385103                    5                1                2
1
## 577   690557                    5                1                1
1
## 578   695091                    1                1                1
1
## 579   695219                    1                1                1
1
## 580   824249                    1                1                1
1
## 581   871549                    5                1                2
1
## 582   878358                    5                7               10
6
## 583  1107684                    6               10                5
5
## 584  1115762                    3                1                1
1
## 585  1217717                    5                1                1
6
## 586  1239420                    1                1                1
1
## 587  1254538                    8               10               10
10
## 588  1261751                    5                1                1
1
## 589  1268275                    9                8                8
9
```

```
## 590  1272166                 5               1                1
1
## 591  1294261                 4              10                8
5
## 592  1295529                 2               5                7
6
## 593  1298484                10               3                4
5
## 594  1311875                 5               1                2
1
## 595  1315506                 4               8                6
3
## 596  1320141                 5               1                1
1
## 597  1325309                 4               1                2
1
## 598  1333063                 5               1                3
1
## 599  1333495                 3               1                1
1
## 600  1334659                 5               2                4
1
## 601  1336798                 3               1                1
1
## 602  1344449                 1               1                1
1
## 603  1350568                 4               1                1
1
## 604  1352663                 5               4                6
8
## 605   188336                 5               3                2
8
## 606   352431                10               5               10
3
## 607   353098                 4               1                1
2
## 608   411453                 1               1                1
1
## 609   557583                 5              10               10
10
## 610   636375                 5               1                1
1
## 611   736150                10               4                3
10
## 612   803531                 5              10               10
10
## 613   822829                 8              10               10
10
## 614  1016634                 2               3                1
1
```

```
## 615  1031608               2               1               1
1
## 616  1041043               4               1               3
1
## 617  1042252               3               1               1
1
## 618  1057067               1               1               1
1
## 619  1061990               4               1               1
1
## 620  1073836               5               1               1
1
## 621  1083817               3               1               1
1
## 622  1096352               6               3               3
3
## 623  1140597               7               1               2
3
## 624  1149548               1               1               1
1
## 625  1174009               5               1               1
2
## 626  1183596               3               1               3
1
## 627  1190386               4               6               6
5
## 628  1190546               2               1               1
1
## 629  1213273               2               1               1
1
## 630  1218982               4               1               1
1
## 631  1225382               6               2               3
1
## 632  1235807               5               1               1
1
## 633  1238777               1               1               1
1
## 634  1253955               8               7               4
4
## 635  1257366               3               1               1
1
## 636  1260659               3               1               4
1
## 637  1268952              10              10               7
8
## 638  1275807               4               2               4
3
## 639  1277792               4               1               1
1
```

```
## 640  1277792                    5               1                1
3
## 641  1285722                    4               1                1
3
## 642  1288608                    3               1                1
1
## 643  1290203                    3               1                1
1
## 644  1294413                    1               1                1
1
## 645  1299596                    2               1                1
1
## 646  1303489                    3               1                1
1
## 647  1311033                    1               2                2
1
## 648  1311108                    1               1                1
3
## 649  1315807                    5              10               10
10
## 650  1318671                    3               1                1
1
## 651  1319609                    3               1                1
2
## 652  1323477                    1               2                1
3
## 653  1324572                    5               1                1
1
## 654  1324681                    4               1                1
1
## 655  1325159                    3               1                1
1
## 656  1326892                    3               1                1
1
## 657  1330361                    5               1                1
1
## 658  1333877                    5               4                5
1
## 659  1334015                    7               8                8
7
## 660  1334667                    1               1                1
1
## 661  1339781                    1               1                1
1
## 662  1339781                    4               1                1
1
## 663 13454352                    1               1                3
1
## 664  1345452                    1               1                3
1
```

```
## 665  1345593                 3                1                1
3
## 666  1347749                 1                1                1
1
## 667  1347943                 5                2                2
2
## 668  1348851                 3                1                1
1
## 669  1350319                 5                7                4
1
## 670  1350423                 5               10               10
8
## 671  1352848                 3               10                7
8
## 672  1353092                 3                2                1
2
## 673  1354840                 2                1                1
1
## 674  1354840                 5                3                2
1
## 675  1355260                 1                1                1
1
## 676  1365075                 4                1                4
1
## 677  1365328                 1                1                2
1
## 678  1368267                 5                1                1
1
## 679  1368273                 1                1                1
1
## 680  1368882                 2                1                1
1
## 681  1369821                10               10               10
10
## 682  1371026                 5               10               10
10
## 683  1371920                 5                1                1
1
## 684   466906                 1                1                1
1
## 685   466906                 1                1                1
1
## 686   534555                 1                1                1
1
## 687   536708                 1                1                1
1
## 688   566346                 3                1                1
1
## 689   603148                 4                1                1
1
```

```
## 690   654546              1               1                 1
1
## 691   654546              1               1                 1
3
## 692   695091              5              10                10
5
## 693   714039              3               1                 1
1
## 694   763235              3               1                 1
1
## 695   776715              3               1                 1
1
## 696   841769              2               1                 1
1
## 697   888820              5              10                10
3
## 698   897471              4               8                 6
4
## 699   897471              4               8                 8
5
##      epithelial_size bare_nucleoli bland_chromatin normal_nucleoli mitoses
class
## 1                  2             1               3               1       1
2
## 2                  7            10               3               2       1
2
## 3                  2             2               3               1       1
2
## 4                  3             4               3               7       1
2
## 5                  2             1               3               1       1
2
## 6                  7            10               9               7       1
4
## 7                  2            10               3               1       1
2
## 8                  2             1               3               1       1
2
## 9                  2             1               1               1       5
2
## 10                 2             1               2               1       1
2
## 11                 1             1               3               1       1
2
## 12                 2             1               2               1       1
2
## 13                 2             3               4               4       1
4
## 14                 2             3               3               1       1
2
```

```
## 15                    7             9                5                5        4
4
## 16                    6             1                4                3        1
4
## 17                    2             1                2                1        1
2
## 18                    2             1                3                1        1
2
## 19                    4            10                4                1        2
4
## 20                    2             1                3                1        1
2
## 21                    5            10                5                4        4
4
## 22                    6             7                7               10        1
4
## 23                    2             1                2                1        1
2
## 24                    2          <NA>                7                3        1
4
## 25                    2             1                3                1        1
2
## 26                    2             7                3                6        1
4
## 27                    1             1                2                1        1
2
## 28                    2             1                2                1        1
2
## 29                    2             1                2                1        1
2
## 30                    2             1                1                1        1
2
## 31                    1             1                2                1        1
2
## 32                    2             1                3                1        1
2
## 33                    8             5                7                4        3
4
## 34                    2             1                3                1        1
2
## 35                    2             1                2                1        1
2
## 36                    2             1                2                1        1
2
## 37                    6             1                8                9        1
4
## 38                    1             1                7                1        1
2
## 39                    2            10                5                6        1
4
```

```
## 40                6             7               7               5       1
4
## 41                6          <NA>               7               8       1
2
## 42                3             3               6               5       2
4
## 43                8            10               7               3       3
4
## 44               10             1               3               1       1
4
## 45                8             1               8              10       1
4
## 46                2             1               2               1       2
2
## 47                4             9               4               8       1
4
## 48                2             1               2               1       1
2
## 49                2             1               3               1       1
2
## 50                4             8               3               8       2
4
## 51                2             3               2               1       5
4
## 52                2             4               3               4       1
4
## 53                3             5               4              10       2
4
## 54               10             8               7               3       7
4
## 55                8             8               7               1       1
4
## 56                4             5               3               6       1
4
## 57                3             6               3               9       1
4
## 58                5             1               5               4       4
4
## 59                6            10               5               1       1
4
## 60                2             2               5               1       1
4
## 61                3             3               4              10       1
4
## 62                2             2               2               1       1
2
## 63               10             8               3               3       1
4
## 64                5             2               3               9       1
4
```

```
## 65                     2             1                2                1       1
2
## 66                     3             2                4                3      10
4
## 67                     2             1                3                1       1
2
## 68                     8            10                4                9       1
4
## 69                     4             9                8                9       8
4
## 70                     2             1                3                2       1
2
## 71                     2             1                2                1       1
2
## 72                    10             2                7                8      10
4
## 73                     2             1                7                2       1
2
## 74                     6            10                4                8       1
4
## 75                     3             4                3                2       3
4
## 76                     2             2                4                2       1
2
## 77                     2             1                2                1       1
2
## 78                     2             1                2                1       1
2
## 79                     2             3                3                1       1
2
## 80                     3             1                2                1       1
2
## 81                     1             1                7                1       1
2
## 82                     2             1                2                1       1
2
## 83                     2             1                3                1       1
2
## 84                     2             2                7                1       1
2
## 85                     8             9                7               10       7
4
## 86                    10             4                4               10      10
4
## 87                     5             8                4                4       1
4
## 88                     5            10                6                8       3
4
## 89                     2             1                3                1       1
2
```

```
## 90                  3             1                2                1       1
2
## 91                  2             1                3                1       1
2
## 92                  2             1                1                1       1
2
## 93                  2             1                3                1       1
2
## 94                  2             1                2                1       1
2
## 95                  2             1                3                1       1
2
## 96                  2             1                3                1       1
2
## 97                  2             1                1                1       1
2
## 98                  2             1                3                1       1
2
## 99                 10             6                2                9      10
4
## 100                 5            10                7                9       4
4
## 101                10             5                3               10       2
4
## 102                 2             5                2                5       1
4
## 103                 2             1                3                1       1
2
## 104                 6             3                7                1       1
4
## 105                10             1                8                8       8
4
## 106                 3             3                3                2       7
4
## 107                 2            10                4                1       1
4
## 108                 8            10                5                7       1
4
## 109                 2             1                2                3       1
2
## 110                 3             9                7                8       3
4
## 111                 2             2                5                3       2
2
## 112                 5             9                3                1       1
4
## 113                 2            10                7                3       3
4
## 114                10             8                8                1       1
4
```

```
## 115               2             3               3               1       1
2
## 116               2             5               1               1       1
2
## 117               2             2               3               2       1
2
## 118               4            10               7               5       8
4
## 119               4             3               1               1       1
2
## 120               2             2               3               1       1
2
## 121               2             1               3               1       1
2
## 122               2             2               3               1       1
2
## 123              10            10               5               3       3
4
## 124               8            10               5               3       1
4
## 125               9             7               8              10       1
4
## 126               2             1               2               1       1
2
## 127               4            10               7               5       5
4
## 128               2             1               3               1       1
2
## 129               5            10               1               6       2
4
## 130              10             1               1               1       1
2
## 131               2             1               2               1       1
2
## 132               2             1               3               1       1
2
## 133               8            10               3               6       3
4
## 134               2             1               2               2       1
2
## 135               3             1               2               1       1
2
## 136               2             2               3               3       1
2
## 137               2             1               2               1       1
2
## 138               2             1               1               1       1
2
## 139               2             1               2               1       1
2
```

```
## 140                    1          <NA>                2                 1       1
2
## 141                    2             1                1                 1       1
2
## 142                    2             1                1                 1       1
2
## 143                    4             5                4                 3       3
4
## 144                    2             5                1                 1       1
2
## 145                    2             1                2                 1       1
2
## 146                    2          <NA>                2                 1       1
2
## 147                    6             8                4                 1       1
4
## 148                    3             2                2                 1       1
2
## 149                    8             1                5                 8       1
2
## 150                   10            10                7                 8       7
4
## 151                    1             1                3                 1       1
2
## 152                    6            10                5                 4       3
4
## 153                    4             5                8                10       1
4
## 154                    2             3                1                 1       1
2
## 155                    2             1                1                 1       1
2
## 156                    3            10                3                 1       1
4
## 157                    2             1                2                 1       1
2
## 158                    2             1                3                 1       1
2
## 159                    3          <NA>                1                 1       1
2
## 160                    6            10                7                10       6
4
## 161                    5            10                5                 7       2
4
## 162                    2             1                3                 2       1
2
## 163                    2             1                3                 1       1
2
## 164                    1             3                1                 1       7
2
```

```
## 165                 2          <NA>               3                1       1
2
## 166                 2             2               3                2       1
2
## 167                 8            10               3               10       3
4
## 168                 6             1               3                1      10
4
## 169                 2             1               3                1       1
2
## 170                 1             1               1                1       1
2
## 171                 2             1               1                1       1
2
## 172                 2             1               3                1       1
2
## 173                 2             1               2                1       1
2
## 174                 8            10              10               10       7
4
## 175                 3            10               6                1       1
4
## 176                10            10               5                7       1
4
## 177                 2             1               3                1       1
2
## 178                 8             1               5               10       3
4
## 179                 2             1               3                1       1
2
## 180                 6            10               3                1       1
4
## 181                 1             1               3                1       1
2
## 182                 2             1               1                1       1
2
## 183                 2             1               3                1       1
2
## 184                 5            10               7                8       1
4
## 185                 4            10               5                1       1
4
## 186                 1             1               3                1       1
2
## 187                 5             8               7               10       1
4
## 188                 6            10               7                7      10
4
## 189                 5             8               9               10       1
4
```

```
## 190                    2              1                 3               1        1
2
## 191                    6              8                 7              10        1
4
## 192                   10             10                 4              10        3
4
## 193                    2              1                 2               1        1
2
## 194                    2              1                 3               1        1
2
## 195                    2              1                 3               1        1
2
## 196                    2              1                 3               1        1
2
## 197                    4              7                 7               8        2
2
## 198                    2              1                 3               1        1
2
## 199                    2              1                 1               1        1
2
## 200                    2              1                 2               1        1
2
## 201                    5             10                 7               8        3
4
## 202                   10             10                 8               1        1
4
## 203                    2              1                 3               1        1
2
## 204                    2              1                 3               1        1
2
## 205                    2              1                 3               1        1
2
## 206                    6             10                 7              10        5
4
## 207                    7              5                 3               5        1
4
## 208                    1              1                 3               1        1
2
## 209                    1              1                 3               1        1
2
## 210                    1              1                 3               1        1
2
## 211                    5             10                 8              10        6
4
## 212                    4              8                 7               7        1
4
## 213                    2              1                 3               1        1
2
## 214                    7             10                 7              10        4
4
```

```
## 215                3             10               10               6        1
4
## 216                5              5                5              10        2
4
## 217                2              1                2               1        1
2
## 218                2              1                3               1        1
2
## 219                6              4                8              10        2
4
## 220                2              1                3               1        1
2
## 221                2              1                3               1        1
2
## 222               10             10                9              10        1
4
## 223                1              5                2               1        1
4
## 224                3              8                7               4        1
4
## 225                3             10                7               9        2
4
## 226                2              1                2               1        1
2
## 227                4             10                8               9        1
4
## 228                3              5                7               7        1
4
## 229                1              1                3               1        1
2
## 230               10             10                9              10        1
4
## 231                3              7                7               6        1
4
## 232                6              8                8               9        2
4
## 233                3              1                4               3        1
2
## 234                5             10                4               1        1
4
## 235                3              1                3               6        1
2
## 236                2           <NA>                3               1        1
2
## 237                8             10                4               8       10
4
## 238                6              2                4              10        4
4
## 239                6              9                3              10       10
4
```

```
## 240                 3           10              5               3       2
4
## 241                 2            2              2               3       1
2
## 242                 1            1              3               1       1
2
## 243                 2            1              3               1       1
2
## 244                 2            5              5               1       1
2
## 245                 2            1              3               1       1
2
## 246                 2            2              3               1       1
2
## 247                 5           10              7               8       1
4
## 248                 2            9              3               3       1
4
## 249                 2            1              3               6       1
2
## 250                 2         <NA>              3               1       1
2
## 251                 2            1              1               1       1
2
## 252                 2           10              5               3       3
4
## 253                 3           10              3               5       3
2
## 254                 8           10              7               3       3
4
## 255                10            8              3               3       1
4
## 256                 4           10              3               6       1
4
## 257                 2            1              1               1       1
2
## 258                 2            1              2               1       1
2
## 259                 2            1              3               1       1
2
## 260                 5            8              3               4       1
2
## 261                 3           10              5               1       3
4
## 262                10           10             10               6       5
4
## 263                 5           10              7               8       1
4
## 264                 6           10              5               5       1
4
```

```
## 265                10           3               5               3       3
4
## 266                 2           1               3               2       1
2
## 267                 3          10               4               3       2
4
## 268                 3          10               7               1       1
4
## 269                 3           4               8               7       8
4
## 270                 2           1               3               1       1
2
## 271                 3          10               3               9       2
4
## 272                 2           1               3               1       1
2
## 273                 3          10               7               1       1
4
## 274                 3           4               3               3       1
4
## 275                 2           1               3               2       1
2
## 276                 2        <NA>               2               1       1
2
## 277                 2           1               2               1       1
2
## 278                 2           1               2               1       1
2
## 279                 2           1               3               1       1
2
## 280                 3           7               3               3       8
4
## 281                 2           1               3               1       1
2
## 282                 2           1               3               1       1
2
## 283                 4          10               5               6       1
4
## 284                 2          10               5               3       1
4
## 285                 2          10               3               8       2
4
## 286                 8          10              10               7       3
4
## 287                10          10               4              10      10
4
## 288                 3           1               2               1       1
2
## 289                 4           5               5              10       1
4
```

```
## 290                     6             10                 4                10        4
4
## 291                     2              1                 1                 1        1
2
## 292                     2              1                 3                 1        1
2
## 293                     2           <NA>                 6                10        1
4
## 294                     2             10                 2                 3        1
4
## 295                     2           <NA>                 2                 1        1
2
## 296                     6             10                 7                 4        1
4
## 297                     4              5                 4                 7        1
2
## 298                     2           <NA>                 2                 3        1
2
## 299                     5              1                 1                 1        1
2
## 300                     4             10                 7                 7        2
4
## 301                     4              4                 7                10        1
4
## 302                     2              1                 3                 1        1
2
## 303                     9             10                 7                10       10
4
## 304                     2              1                 3                 1        1
2
## 305                     3             10                 3                 3        1
4
## 306                     4             10                 3                10        4
4
## 307                     2              1                 3                 1        1
2
## 308                     2              1                 3                 1        1
2
## 309                     4              3                 8                 8        4
4
## 310                     2              5                 5                 1        1
2
## 311                     3              1                 2                 1        1
2
## 312                     2              1                 1                 1        1
2
## 313                    10              1                 3                 5        1
4
## 314                     2              1                 1                 1        1
2
```

```
## 315                     1             1                2                1       1
2
## 316                     7          <NA>                4                9       1
2
## 317                     5            10                4                3       1
4
## 318                     6             8                8                9       1
4
## 319                     5             1                3                1       1
2
## 320                     6             5                7                3       1
2
## 321                     5            10                7                4       6
4
## 322                     2          <NA>                3                1       1
2
## 323                     2             1                3                1       1
2
## 324                     2            10                4                1       1
4
## 325                     2             1                3                1       1
2
## 326                     2             1                2                3       1
2
## 327                     2            10                5                4       1
4
## 328                     2             1                2                1       1
2
## 329                     6             4                3               10       1
4
## 330                     5            10                7                1       1
4
## 331                     2             8                6                1       1
4
## 332                     2             1                3                1       2
2
## 333                     2             1                2                2       1
2
## 334                     4            10                4                3       1
4
## 335                     3            10                3                4       2
4
## 336                     2             1                1                1       1
2
## 337                     4            10                3                4       1
4
## 338                     2             1                3                1       1
2
## 339                     1             1                2                1       1
2
```

```
## 340                2             10                4               3       1
4
## 341                2             10                7               6       1
4
## 342                2              1                3               1       1
2
## 343                2              1                1               1       1
2
## 344                2              1                1               1       1
2
## 345               10             10                9               5       3
4
## 346                2              1                1               1       1
2
## 347                3              1                1               3       1
2
## 348                1              1                1               3       1
2
## 349                5              1                3               3       1
4
## 350                3              8                7               6       1
4
## 351                2              1                1               1       1
2
## 352                2              1                3               1       1
2
## 353                7              3                4               6       1
2
## 354                7             10                4               9       4
4
## 355                2              1                2               1       1
2
## 356                3              1                2               2       1
2
## 357                3              3                3               3       3
4
## 358               10             10                7               3       8
4
## 359                8              4                4              10       3
4
## 360                3              7                3               5       3
4
## 361               10             10                8              10      10
4
## 362                6             10                5               1       4
4
## 363                4              3                2               1       1
2
## 364                2              3                2               1       1
2
```

```
## 365                     2             1                3                1        1
2
## 366                     2             1                2                1        1
2
## 367                     8            10                7               10        7
4
## 368                     5            10                8               10        3
4
## 369                     2             1                1                1        1
2
## 370                     1             1                2                1        1
2
## 371                     3             1                2                1        1
2
## 372                     2             1                1                1        1
2
## 373                     2             1                2                1        1
2
## 374                     2             1                2                1        1
2
## 375                     2             1                2                1        1
2
## 376                     2             1                1                1        1
2
## 377                     2             1                2                1        1
2
## 378                     1             1                2                1        1
2
## 379                     3             1                2                2        1
2
## 380                     4             1                3                1        1
2
## 381                     2             1                1                1        1
2
## 382                     4            10                7                8        4
4
## 383                     2             1                3                2        1
2
## 384                     2             1                1                1        1
2
## 385                     2             1                1                1        1
2
## 386                     3             1                1                2        3
2
## 387                     2            10                7                1        1
4
## 388                     3             1                3                1        1
2
## 389                     2             1                2                2        1
2
```

```
## 390                3             2               2               2       1
2
## 391                2             1               2               1       1
2
## 392                3            10               7               9       1
4
## 393                2             1               2               1       1
2
## 394                1             1               1               1       1
2
## 395                2             1               2               1       1
2
## 396                2             1               2               1       1
2
## 397                2             1               3               1       1
2
## 398                2             1               1               1       1
2
## 399                2             1               2               2       1
2
## 400                2             1               1               1       1
2
## 401                6             9               9               3       8
4
## 402                2             1               1               1       1
2
## 403                2             1               2               1       1
2
## 404                2             4               1               1       1
2
## 405                2             1               1               2       1
2
## 406                2             1               2               1       1
2
## 407                2             1               2               1       1
2
## 408                2             1               2               1       1
2
## 409                2             2               3               1       1
2
## 410                2             1               2               1       1
2
## 411                2             1               2               1       1
2
## 412                1          <NA>               2               1       1
2
## 413                8             4               8               5       1
4
## 414                2             1               3               1       1
2
```

```
## 415                    3             10               6               6       1
4
## 416                    3              3               3               5       1
2
## 417                   10             10               7               2       1
4
## 418                    2              1               2               1       1
2
## 419                    2              2               3               2       2
2
## 420                    5              1               1               1       1
2
## 421                    2              3               3               1       1
2
## 422                   10             10               8               2       1
4
## 423                    2              1               3               3       1
2
## 424                    2              1               2               1       1
2
## 425                    2              1               1               1       1
2
## 426                   10             10              10              10       1
4
## 427                    2              1               1               1       1
2
## 428                    4              2               5              10       1
4
## 429                    2              1               2               1       1
2
## 430                    2              1               2               1       1
2
## 431                    2              1               2               2       1
2
## 432                    4              1               3               2       1
2
## 433                    2              1               2               2       1
2
## 434                    2              1               1               1       1
2
## 435                    5              8               4               2       1
2
## 436                    3             10               5               1       1
4
## 437                    6              1               2               8       1
4
## 438                    2              1               1               1       1
2
## 439                    2              1               1               1       1
2
```

```
## 440                       2              1                1                1        1
2
## 441                       4             10               10                1        1
4
## 442                       2              4                1                1        1
2
## 443                       2              3                1                1        1
2
## 444                       2              2                1                1        1
2
## 445                       3              1                2                1        1
2
## 446                       2              1                1                1        1
2
## 447                       2              1                1                1        1
2
## 448                       2              1                1                1        1
2
## 449                       1              1                1                1        1
2
## 450                       6             10                8               10        1
4
## 451                       1              1                2                1        1
2
## 452                       2              1                1                1        1
2
## 453                       2              1                1                1        1
2
## 454                       6             10               10                7        1
4
## 455                       3              1                1                1        1
2
## 456                       2              6                1                1        2
4
## 457                       5             10                8                6        1
4
## 458                       6              3               10               10        1
4
## 459                       2              1                1                1        1
2
## 460                       2              1                1                1        1
2
## 461                       2              1                1                1        1
2
## 462                       2              5                1                1        1
2
## 463                       2              1                1                1        1
2
## 464                       2              1                1                2        1
2
```

```
## 465                   2              1                1                1        1
2
## 466                   6              4                7               10        3
4
## 467                   4             10                9                7        1
4
## 468                   4             10                7                6        2
4
## 469                   2              1                1                1        1
2
## 470                   2              1                2                1        1
2
## 471                   1              1                2                1        1
2
## 472                   2              1                1                1        1
2
## 473                   1              1                1                1        1
2
## 474                   2              1                1                1        1
2
## 475                   2              1                1                1        1
2
## 476                   2              1                1                1        1
2
## 477                   2              1                1                1        1
2
## 478                   2              1                1                1        1
2
## 479                   2              1                1                1        1
2
## 480                   4             10                7                5        1
4
## 481                   1              1                1                1        1
2
## 482                   2              1                1                1        1
2
## 483                  10              5               10               10       10
4
## 484                   5             10                9               10        1
4
## 485                   2              1                1                1        1
2
## 486                   1              3                1                1        1
2
## 487                   1              1                2                1        1
2
## 488                   6             10                8                1        5
4
## 489                   3              3                3                4        1
4
```

```
## 490                    3              4               4               1       1
4
## 491                    2              1               1               1       1
2
## 492                    3             10               7               1       1
4
## 493                    1              1               2               1       1
2
## 494                    6             10               6               5       2
4
## 495                    4              5               2               1       1
2
## 496                    1              1               2               1       1
2
## 497                    1              1               1               1       1
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## 498                    2              1               1               1       1
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## 499                    2              1               2               1       1
2
## 500                    2              1               2               1       1
2
## 501                    2              1               3               1       1
2
## 502                    2              1               2               1       1
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## 503                    2              1               2               1       1
2
## 504                    2              1               3               1       1
2
## 505                    2              1               1               1       1
2
## 506                    2              1               1               1       1
2
## 507                    7              5               4               8       7
4
## 508                    2              4               1               1       1
2
## 509                    2              1               1               1       1
2
## 510                    2              1               1               1       1
2
## 511                    2              1               1               1       1
2
## 512                    2              1               2               1       1
2
## 513                    2              1               1               1       1
2
## 514                    1              1               2               1       1
2
```

```
## 515                     3           10                8                10        2
4
## 516                     3           10                9                10        1
4
## 517                     1            1                1                 1        1
2
## 518                     1            1                2                 1        1
2
## 519                     2            1                1                 1        1
2
## 520                     4           10                9                 1        1
4
## 521                     3            1                1                 1        1
2
## 522                     3            1                1                 1        1
2
## 523                     3            5                7                 3        1
4
## 524                     4           10                5                 3        1
4
## 525                     2            1                2                 1        1
2
## 526                     2            1                1                 1        1
2
## 527                     2            1                1                 1        1
2
## 528                     2            1                3                 1        1
2
## 529                     2            1                1                 1        1
2
## 530                     1            1                2                 1        1
2
## 531                     4           10                6                 9        1
4
## 532                     2            1                2                 1        1
2
## 533                     1            1                3                 1        1
2
## 534                     2            1                2                 1        1
2
## 535                     2            1                2                 1        1
2
## 536                     2            1                3                 1        1
2
## 537                     2            1                3                 1        1
2
## 538                     2            1                3                 1        1
2
## 539                     2            1                2                 1        1
2
```

```
## 540                    2            1               2               1       1
2
## 541                    2            2               2               1       1
2
## 542                    2            1               1               1       1
2
## 543                    2            1               1               1       1
2
## 544                    2            1               2               1       1
2
## 545                    2            1               2               1       1
2
## 546                    2            1               2               1       1
2
## 547                    4           10               7              10       1
4
## 548                    1            1               1               1       1
2
## 549                    1            1               1               1       1
2
## 550                    4            5               7               8       2
4
## 551                    2            1               2               1       1
2
## 552                    2            1               3               1       1
2
## 553                    2            1               4               2       1
2
## 554                    2            5               2               1       2
2
## 555                    2            1               1               1       1
2
## 556                    2            1               4               8       1
2
## 557                    1            1               2               1       1
2
## 558                    2            1               1               1       1
2
## 559                    2            1               2               1       1
2
## 560                    2            1               2               1       1
2
## 561                    2            1               3               1       1
2
## 562                    2            1               3               1       1
2
## 563                    2            1               3               1       1
2
## 564                    2            1               2               1       1
2
```

```
## 565                     2              1                3                2        1
2
## 566                     5             10               10               10        1
4
## 567                     2              1                3                1        1
2
## 568                     2              3                2                1        1
2
## 569                     6             10                2                5        2
4
## 570                     6              5               10                3        1
4
## 571                     8             10                8                2        1
4
## 572                     3             10                9               10        2
4
## 573                     2              1                2                1        1
2
## 574                     2              1                2                1        1
2
## 575                     4              2                7                7        1
4
## 576                     2              1                3                1        1
2
## 577                     2              1                2                1        1
2
## 578                     2              1                2                1        1
2
## 579                     2              1                2                1        1
2
## 580                     2              1                3                1        1
2
## 581                     2              1                2                1        1
2
## 582                     5             10                7                5        1
4
## 583                     4             10                6               10        1
4
## 584                     2              1                1                1        1
2
## 585                     3              1                1                1        1
2
## 586                     2              1                1                1        1
2
## 587                     6             10               10               10        1
4
## 588                     2              1                2                2        1
2
## 589                     6              3                4                1        1
4
```

```
## 590               2             1               1               1       1
2
## 591               4             1              10               1       1
4
## 592               4            10               7               6       1
4
## 593               3            10               4               1       1
4
## 594               2             1               1               1       1
2
## 595               4            10               7               1       1
4
## 596               2             1               2               1       1
2
## 597               2             1               2               1       1
2
## 598               2             1               3               1       1
2
## 599               2             1               2               1       1
2
## 600               1             1               1               1       1
2
## 601               2             1               2               1       1
2
## 602               1             1               2               1       1
2
## 603               2             1               2               1       1
2
## 604               4             1               8              10       1
4
## 605               5            10               8               1       2
4
## 606               5             8               7               8       3
4
## 607               2             1               1               1       1
2
## 608               2             1               1               1       1
2
## 609              10            10              10               1       1
4
## 610               2             1               1               1       1
2
## 611               3            10               7               1       2
4
## 612               5             2               8               5       1
4
## 613               6            10              10              10      10
4
## 614               2             1               2               1       1
2
```

```
## 615                    1             1                2                1       1
2
## 616                    2             1                2                1       1
2
## 617                    2             1                2                1       1
2
## 618                    1             ?                1                1       1
2
## 619                    2             1                2                1       1
2
## 620                    2             1                2                1       1
2
## 621                    2             1                2                1       1
2
## 622                    3             2                6                1       1
2
## 623                    2             1                2                1       1
2
## 624                    2             1                1                1       1
2
## 625                    1             1                2                1       1
2
## 626                    3             4                1                1       1
2
## 627                    7             6                7                7       3
4
## 628                    2             5                1                1       1
2
## 629                    2             1                1                1       1
2
## 630                    2             1                1                1       1
2
## 631                    2             1                1                1       1
2
## 632                    2             1                2                1       1
2
## 633                    2             1                1                1       1
2
## 634                    5             3                5               10       1
4
## 635                    2             1                1                1       1
2
## 636                    2             1                1                1       1
2
## 637                    7             1               10               10       3
4
## 638                    2             2                2                1       1
2
## 639                    2             1                1                1       1
2
```

```
## 640                      2             1                1                1       1
2
## 641                      2             1                1                1       1
2
## 642                      2             1                2                1       1
2
## 643                      2             1                2                1       1
2
## 644                      2             1                1                1       1
2
## 645                      2             1                1                1       1
2
## 646                      2             1                2                1       1
2
## 647                      2             1                1                1       1
2
## 648                      2             1                1                1       1
2
## 649                     10             2               10               10      10
4
## 650                      2             1                2                1       1
2
## 651                      3             4                1                1       1
2
## 652                      2             1                2                1       1
2
## 653                      2             1                2                2       1
2
## 654                      2             1                2                1       1
2
## 655                      2             1                3                1       1
2
## 656                      2             1                2                1       1
2
## 657                      2             1                2                1       1
2
## 658                      8             1                3                6       1
2
## 659                      3            10                7                2       3
4
## 660                      2             1                1                1       1
2
## 661                      2             1                2                1       1
2
## 662                      2             1                3                1       1
2
## 663                      2             1                2                1       1
2
## 664                      2             1                2                1       1
2
```

```
## 665                      2             1                2                1       1
2
## 666                      2             1                1                1       1
2
## 667                      2             1                1                1       2
2
## 668                      2             1                3                1       1
2
## 669                      6             1                7               10       3
4
## 670                      5             5                7               10       1
4
## 671                      5             8                7                4       1
4
## 672                      2             1                3                1       1
2
## 673                      2             1                3                1       1
2
## 674                      3             1                1                1       1
2
## 675                      2             1                2                1       1
2
## 676                      2             1                1                1       1
2
## 677                      2             1                2                1       1
2
## 678                      2             1                1                1       1
2
## 679                      2             1                1                1       1
2
## 680                      2             1                1                1       1
2
## 681                      5            10               10               10       7
4
## 682                      4            10                5                6       3
4
## 683                      2             1                3                2       1
2
## 684                      2             1                1                1       1
2
## 685                      2             1                1                1       1
2
## 686                      2             1                1                1       1
2
## 687                      2             1                1                1       1
2
## 688                      2             1                2                3       1
2
## 689                      2             1                1                1       1
2
```

```
## 690                  2             1               1               1       8
2
## 691                  2             1               1               1       1
2
## 692                  4             5               4               4       1
4
## 693                  2             1               1               1       1
2
## 694                  2             1               2               1       2
2
## 695                  3             2               1               1       1
2
## 696                  2             1               1               1       1
2
## 697                  7             3               8              10       2
4
## 698                  3             4              10               6       1
4
## 699                  4             5              10               4       1
4
```

```
summary(breastcancer)
```

```
##        id           clump_thickness  size_uniformity  shape_uniformity
##  Min.   :   61634   Min.   : 1.000   Min.   : 1.000   Min.   : 1.000  
##  1st Qu.:  870688   1st Qu.: 2.000   1st Qu.: 1.000   1st Qu.: 1.000  
##  Median : 1171710   Median : 4.000   Median : 1.000   Median : 1.000  
##  Mean   : 1071704   Mean   : 4.418   Mean   : 3.134   Mean   : 3.207  
##  3rd Qu.: 1238298   3rd Qu.: 6.000   3rd Qu.: 5.000   3rd Qu.: 5.000  
##  Max.   :13454352   Max.   :10.000   Max.   :10.000   Max.   :10.000  
##  marginal_adhesion epithelial_size  bare_nucleoli      bland_chromatin 
##  Min.   : 1.000    Min.   : 1.000   Length:699         Min.   : 1.000  
##  1st Qu.: 1.000    1st Qu.: 2.000   Class :character   1st Qu.: 2.000  
##  Median : 1.000    Median : 2.000   Mode  :character   Median : 3.000  
##  Mean   : 2.807    Mean   : 3.216                      Mean   : 3.438  
##  3rd Qu.: 4.000    3rd Qu.: 4.000                      3rd Qu.: 5.000  
##  Max.   :10.000    Max.   :10.000                      Max.   :10.000  
##  normal_nucleoli     mitoses           class     
##  Min.   : 1.000   Min.   : 1.000   Min.   :2.00  
##  1st Qu.: 1.000   1st Qu.: 1.000   1st Qu.:2.00  
##  Median : 1.000   Median : 1.000   Median :2.00  
##  Mean   : 2.867   Mean   : 1.589   Mean   :2.69  
##  3rd Qu.: 4.000   3rd Qu.: 1.000   3rd Qu.:4.00  
##  Max.   :10.000   Max.   :10.000   Max.   :4.00
```

#a. describe what is the dataset all about. #ANSWER: The dataset ‘breastcancer_wisconsin’ is a database of clinical reports of breastcancer cases. The dataset contains various features or characteristics of breast cancer tumors, including information about their size, shape, adhesion properties, cell characteristics, and mitotic activity. The goal might be to analyze these features to predict or understand the nature of the tumors, particularly whether they are benign or malignant.

#d. Compute the descriptive statistics using different packages. Find the values of: #d.1 Standard error of the mean for clump thickness. #Using stdError function

```
clump_thickness <- breastcancer$clump_thickness
stderror_clump_thickness <- stdError(clump_thickness)
stderror_clump_thickness

## [1] 0.1065011
```

#d.2 Coefficient of variability for Marginal Adhesion. #Using mean and standard deviation to get the Coefficient of Variation.

```
marginal_adhesion <- breastcancer$marginal_adhesion
mean <- mean(marginal_adhesion)
sd <- sd(marginal_adhesion)
cv <- sd / mean
cv

## [1] 1.017283

cv<-cv*100
cv

## [1] 101.7283
```

#d.3 Number of null values of Bare Nuclei.

```
bare_nuclei_data <- breastcancer$bare_nucleoli
null_values <- sum(is.na(bare_nuclei_data))
null_values

## [1] 15
```

#d.4 Mean and standard deviation for Bland Chromatin #Using mean and standard deviation

```
bland_chromatin <- breastcancer$bland_chromatin
bland_chromatin_mean <- mean(bland_chromatin)
bland_chromatin_sd <- sd(bland_chromatin)
bland_chromatin_mean

## [1] 3.437768

bland_chromatin_sd

## [1] 2.438364
```

#d.5 Confidence interval of the mean for Uniformity of Cell Shape #Using t.test function

```r
uniformity_cell_shape <- breastcancer$shape_uniformity
confidence_interval <- t.test(uniformity_cell_shape, na.rm = TRUE)$conf.int
print(confidence_interval)

## [1] 2.986741 3.428138
## attr(,"conf.level")
## [1] 0.95
```

#d. How many attributes?

```r
length(breastcancer)

## [1] 11

names(breastcancer)

##  [1] "id"                "clump_thickness"   "size_uniformity"
##  [4] "shape_uniformity"  "marginal_adhesion" "epithelial_size"
##  [7] "bare_nucleoli"     "bland_chromatin"   "normal_nucleoli"
## [10] "mitoses"           "class"
```

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

```r
str(breastcancer)

## 'data.frame':    699 obs. of  11 variables:
##  $ id               : int  1000025 1002945 1015425 1016277 1017023 1017122
1018099 1018561 1033078 1033078 ...
##  $ clump_thickness  : int  5 5 3 6 4 8 1 2 2 4 ...
##  $ size_uniformity  : int  1 4 1 8 1 10 1 1 1 2 ...
##  $ shape_uniformity : int  1 4 1 8 1 10 1 2 1 1 ...
##  $ marginal_adhesion: int  1 5 1 1 3 8 1 1 1 1 ...
##  $ epithelial_size  : int  2 7 2 3 2 7 2 2 2 2 ...
##  $ bare_nucleoli    : chr  "1" "10" "2" "4" ...
##  $ bland_chromatin  : int  3 3 3 3 3 9 3 3 1 2 ...
##  $ normal_nucleoli  : int  1 2 1 7 1 7 1 1 1 1 ...
##  $ mitoses          : int  1 1 1 1 1 1 1 1 5 1 ...
##  $ class            : int  2 2 2 2 2 4 2 2 2 2 ...

malignant_percentage <- sum(breastcancer$class == 4) / nrow(breastcancer) *
100
malignant_percentage

## [1] 34.47783
```

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

```r
library("AppliedPredictiveModeling")

## Warning: package 'AppliedPredictiveModeling' was built under R version
4.3.2
```

```r
data("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

Abalone_excel <- "~/rPorgrammingCodes/Activities/worksheet
6/Abalone_excel.xlsx"
writexl::write_xlsx(abalone, Abalone_excel, col_names = TRUE)
```