RWorksheet_5.Rmd

2023-12-06

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

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

```
library(Hmisc)
```

```
##
## Attaching package: 'Hmisc'

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

```
library(pastecs)
studentData<- data.frame(
  Student <- c(1:10),
  preTest <- c(55,54,47,57,51,61,57,54,63,58),
  postTest <- c(61,60,56,63,56,63,59,56,62,61))

colnames(studentData) <- c("Student", "preTest","postTest")
studentData
```

```
##    Student 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
```

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.

```
fertilizerData<- c(10,10,10, 20,20,50,10,20,10,50,20,50,20,10.)
ordered(fertilizerData)
```

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

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.

```
exerciseLevels<- c("l", "n", "n", "i", "l", "l", "n", "n", "i", "l")
factor_exerciselevels<- factor(exerciseLevels)
```

```r
levels(factor_exerciselevels) <- c("none","light","intense")
factor_exerciselevels
```

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

4a.a. Apply the factor function and factor level. Describe the results.

```r
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")
factor_state<-factor(state)
levels(factor_state)
```

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

```r
factor_state
```

```
##  [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).

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

data <- data.frame(State = factor_state, Income = incomes)
print(data)
```

```
##    State Income
## 1    tas     60
## 2     sa     49
## 3    qld     40
## 4    nsw     61
## 5    nsw     64
## 6     nt     60
## 7     wa     59
## 8     wa     54
## 9    qld     62
## 10   vic     69
## 11   nsw     70
## 12   vic     42
## 13   qld     56
## 14   qld     61
## 15    sa     61
## 16   tas     61
## 17    sa     58
## 18    nt     51
## 19    wa     48
## 20   vic     65
## 21   qld     49
## 22   nsw     49
```

```
## 23   nsw     41
## 24    wa     48
## 25    sa     52
## 26   act     46
## 27   nsw     59
## 28   vic     46
## 29   vic     58
## 30   act     43
```

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

```
mean_income <- tapply(incomes, factor_state, mean)
print(mean_income)
```

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

Interpretation: These values represent the average income for tax accountants from all the states and territories of Australia.

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

```
stdError <- function(x) sqrt(var(x) / length(x))
errors_means <- tapply(incomes, factor_state, stdError)

print(errors_means)
```

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

6.

a. What is the standard error? Write the codes.
b. Interpret the result.

Interpretation: The overall standard error serves as an indicator of how precise the sample mean estimate is for the entire group of tax accountants.

```
total_stdError <- stdError(incomes)
total_stdError
```

```
## [1] 1.524462
```

7. Use the titanic dataset.

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

8. The data sets are about the breast cancer Wisconsin. The samples arrive periodically as Dr. Wolberg reports his clinical cases.

a. describe what is the dataset all about. < The Breast Cancer Wisconsin dataset consists of various quantitative and qualitative features extracted from biopsy samples, each associated with a unique ID number. These features are clump thickness, size uniformity,shape uniformity,marginal adhesion,epithelial size,bare nucleoli,bland chromatin,normal nucleoli,mitoses,class.

b. Compute the descriptive statistics using different packages. Find the values of: d.1 Standard error of the mean for clump thickness. d.2 Coefficient of variability for Marginal Adhesion. d.3 Number of null values of Bare Nuclei. d.4 Mean and standard deviation for Bland Chromatin d.5 Confidence interval of the mean for Uniformity of Cell Shape.

```r
breastCancer_Data <- read.csv("breastcancer_wisconsin.csv")
breastCancer_Data
```

```
##            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     2
## 498                 2             1                1                1        1     2
## 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     2
## 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
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## 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
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## 649	10	2	10	10	10	4
## 650	2	1	2	1	1	2
## 651	3	4	1	1	1	2
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## 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
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## 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

```r
#8.d1
stdError_clumpThickness <- sd(breastCancer_Data$clump_thickness) / sqrt(length(breastCancer_Data$clump_t

stdError_clumpThickness
```

```
## [1] 0.1065011
```

```r
#8.d2
coefficient_marginalAdhesion <- sd(breastCancer_Data$marginal_adhesion) / mean(breastCancer_Data$margina

coefficient_marginalAdhesion
```

```
## [1] 1.017283
```

```r
#8.d3
nullValues_bareNuclei <- sum(is.na(breastCancer_Data$bare_nuclei))

nullValues_bareNuclei
```

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

```r
#8.d4
mean_blandChromatin <- mean(breastCancer_Data$bland_chromatin)
sd_blandChromatin <- sd(breastCancer_Data$bland_chromatin)

mean_blandChromatin
```

```
## [1] 3.437768
```

```r
sd_blandChromatin
```

```
## [1] 2.438364
```

```r
#8.d5
confidenceInterval_uniformityCellShape <- t.test(breastCancer_Data$shape_uniformity)$conf.int

confidenceInterval_uniformityCellShape
```

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

8d. How many attributes?

```r
attributes(breastCancer_Data)
```

```
## $names
##  [1] "id"                "clump_thickness"   "size_uniformity"
##  [4] "shape_uniformity"  "marginal_adhesion" "epithelial_size"
##  [7] "bare_nucleoli"     "bland_chromatin"   "normal_nucleoli"
## [10] "mitoses"           "class"
##
## $class
## [1] "data.frame"
##
## $row.names
##   [1]   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18
##  [19]  19  20  21  22  23  24  25  26  27  28  29  30  31  32  33  34  35  36
##  [37]  37  38  39  40  41  42  43  44  45  46  47  48  49  50  51  52  53  54
```

```
##  [55]  55  56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72
##  [73]  73  74  75  76  77  78  79  80  81  82  83  84  85  86  87  88  89  90
##  [91]  91  92  93  94  95  96  97  98  99 100 101 102 103 104 105 106 107 108
## [109] 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126
## [127] 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144
## [145] 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162
## [163] 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180
## [181] 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198
## [199] 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216
## [217] 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234
## [235] 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252
## [253] 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270
## [271] 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288
## [289] 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306
## [307] 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324
## [325] 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342
## [343] 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360
## [361] 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378
## [379] 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396
## [397] 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414
## [415] 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432
## [433] 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450
## [451] 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468
## [469] 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486
## [487] 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504
## [505] 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522
## [523] 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540
## [541] 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558
## [559] 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576
## [577] 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594
## [595] 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612
## [613] 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630
## [631] 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648
## [649] 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666
## [667] 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684
## [685] 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699
```

8e. Find the percentage of respondents who are malignant. Interpret the results.

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

```r
library(xlsx)
abalone<- read.csv("abalone.csv")
xlsx::write.xlsx(abalone, "abalone.xls", col.names=TRUE, row.names=TRUE, sheetName="sample")

library("AppliedPredictiveModeling")
head(abalone)
```

```
##   Sex Length Diameter Height Whole.weight Shucked.weight Viscera.weight
## 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
##   Shell.weight 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
```

```r
summary(abalone)
```

```
##      Sex                Length         Diameter          Height
##  Length:4177        Min.   :0.075   Min.   :0.0550   Min.   :0.0000
##  Class :character   1st Qu.:0.450   1st Qu.:0.3500   1st Qu.:0.1150
##  Mode  :character   Median :0.545   Median :0.4250   Median :0.1400
##                     Mean   :0.524   Mean   :0.4079   Mean   :0.1395
##                     3rd Qu.:0.615   3rd Qu.:0.4800   3rd Qu.:0.1650
##                     Max.   :0.815   Max.   :0.6500   Max.   :1.1300
##   Whole.weight    Shucked.weight   Viscera.weight    Shell.weight
##  Min.   :0.0020   Min.   :0.0010   Min.   :0.0005   Min.   :0.0015
##  1st Qu.:0.4415   1st Qu.:0.1860   1st Qu.:0.0935   1st Qu.:0.1300
##  Median :0.7995   Median :0.3360   Median :0.1710   Median :0.2340
##  Mean   :0.8287   Mean   :0.3594   Mean   :0.1806   Mean   :0.2388
##  3rd Qu.:1.1530   3rd Qu.:0.5020   3rd Qu.:0.2530   3rd Qu.:0.3290
##  Max.   :2.8255   Max.   :1.4880   Max.   :0.7600   Max.   :1.0050
##      Rings
##  Min.   : 1.000
##  1st Qu.: 8.000
##  Median : 9.000
##  Mean   : 9.934
##  3rd Qu.:11.000
##  Max.   :29.000
```