Lab7

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1. Generate a sequence of random integers between 20 and 30 without replacement, and you want to stop the sequence once a value of 27 is generated. Please use a while loop and an if statement to accomplish this.

```
set.seed(2023)
x<- 0
stop<- FALSE
while(stop == FALSE){
  x<-sample(20:30,1,replace = FALSE)
  print(x)
  if(x == 27){
    stop <- TRUE
  }

}
```

```
## [1] 24
## [1] 28
## [1] 27
```

2. Write a program that reads in a list of numbers (6, 7, 4, 3, 1, 6, 7, 4, 9).

```
listt<-c(6, 7, 4, 3, 1, 6, 7, 4, 9)
even_sum = 0

#(a) calculate the sum of the even numbers using a “for” loop and “if” condition.
for(i in 1:length(listt)){
  if(listt[i] %%2 == 0){
    even_sum <- even_sum + listt[i]
  }

}
#(b) print out "The sum of even numbers is" with the sum of even numbers.
print(paste("The sum of even numbers is ",even_sum))
```

```
## [1] "The sum of even numbers is  20"
```

3. Download the data set boombust.csv and save it to whatever directory you are using for this course. The goal is to write a for-loop to create a new column at the end of the matrix that contains the sum of each row.

```
boom<-read.csv("/Users/itagakikouki/stat123/lab7/boombust.csv")
head(boom)
```

```
##                 Name Projection Ceiling Floor Bust Boom Ownership Optimal
## 1      Jalen Brunson       36.1    41.9  30.2  7.2 62.1      35.3    32.1
## 2        Enes Kanter       40.3    46.6  34.0 10.1 58.1      24.9    21.1
## 3    Josh Richardson       30.0    35.3  24.7 11.9 46.5      26.2    30.4
## 4       De'Aaron Fox       44.7    51.2  38.2 18.4 44.6      19.7    17.5
## 5        LaMelo Ball       47.3    54.1  40.6 19.5 44.6      17.3    18.1
## 6 Kristaps Porzingis       43.4    50.1  36.7 20.1 43.2      26.7    27.4
##   Leverage
## 1     -3.2
## 2     -3.8
## 3      4.2
## 4     -2.2
## 5      0.8
## 6      0.7
```

```
dim(boom)
```

```
## [1] 233   9
```

```
#(a) Create a matrix that contains only the numerical values and name it nums
nums<- as.matrix(boom[, 2:9])
head(nums)
```

```
##      Projection Ceiling Floor Bust Boom Ownership Optimal Leverage
## [1,]       36.1    41.9  30.2  7.2 62.1      35.3    32.1     -3.2
## [2,]       40.3    46.6  34.0 10.1 58.1      24.9    21.1     -3.8
## [3,]       30.0    35.3  24.7 11.9 46.5      26.2    30.4      4.2
## [4,]       44.7    51.2  38.2 18.4 44.6      19.7    17.5     -2.2
## [5,]       47.3    54.1  40.6 19.5 44.6      17.3    18.1      0.8
## [6,]       43.4    50.1  36.7 20.1 43.2      26.7    27.4      0.7
```

```
#(b) Create a new column of zeros at the end of nums by using: nums =
cbind(nums, rep(0, length(nums[,1]))).
#length(nums[,1]) means how many rows there are
nums = cbind(nums, rep(0, length(nums[,1])))
head(nums)
```

```
##      Projection Ceiling Floor Bust Boom Ownership Optimal Leverage
## [1,]       36.1    41.9  30.2  7.2 62.1      35.3    32.1     -3.2 0
## [2,]       40.3    46.6  34.0 10.1 58.1      24.9    21.1     -3.8 0
## [3,]       30.0    35.3  24.7 11.9 46.5      26.2    30.4      4.2 0
## [4,]       44.7    51.2  38.2 18.4 44.6      19.7    17.5     -2.2 0
## [5,]       47.3    54.1  40.6 19.5 44.6      17.3    18.1      0.8 0
## [6,]       43.4    50.1  36.7 20.1 43.2      26.7    27.4      0.7 0
```

```
#(c) Write a for-loop that calculates the sum (for each row) of the first
through eighth columns of nums and saves the sum in the nineth column of
nums. ie.

#When i = 1 sum all of colums of first row
for(i in 1:length(nums[ ,1])){
```

```
  nums[i,9] = sum(nums[i, 1:8])
}
#(d) Print out the nums matrix.
print(nums)
```

```
##        Projection Ceiling Floor  Bust Boom Ownership Optimal Leverage
##   [1,]       36.1    41.9  30.2   7.2 62.1      35.3    32.1     -3.2
241.7
##   [2,]       40.3    46.6  34.0  10.1 58.1      24.9    21.1     -3.8
231.3
##   [3,]       30.0    35.3  24.7  11.9 46.5      26.2    30.4      4.2
209.2
##   [4,]       44.7    51.2  38.2  18.4 44.6      19.7    17.5     -2.2
232.1
##   [5,]       47.3    54.1  40.6  19.5 44.6      17.3    18.1      0.8
242.3
##   [6,]       43.4    50.1  36.7  20.1 43.2      26.7    27.4      0.7
248.3
##   [7,]       53.4    60.5  46.4  22.3 42.3      23.4    23.8      0.4
272.5
##   [8,]       31.2    36.9  25.5  16.4 41.7      12.1     6.7     -5.4
165.1
##   [9,]       44.8    51.4  38.1  21.2 41.5      21.9    20.5     -1.4
238.0
##  [10,]       25.8    31.0  20.6  14.1 41.1      15.2    13.7     -1.5
160.0
##  [11,]       37.3    44.1  30.4  22.8 40.5      27.5    17.4    -10.1
209.9
##  [12,]       33.8    39.5  28.0  18.6 39.2      16.9    17.5      0.6
194.1
##  [13,]       57.2    64.7  49.7  27.2 38.6      25.1    24.9     -0.2
287.2
##  [14,]       27.1    32.2  22.1  15.0 38.3      30.4    16.4    -14.0
167.5
##  [15,]       43.7    50.2  37.2  24.2 36.9      17.9    19.6      1.7
231.4
##  [16,]       31.9    37.4  26.4  18.9 36.5      28.8    11.6    -17.2
174.3
##  [17,]       49.9    57.1  42.8  27.6 36.3      14.4    12.8     -1.6
239.3
##  [18,]       28.5    33.9  23.0  20.0 34.9       1.0     5.2      4.2
150.7
##  [19,]       49.4    56.7  42.2  32.5 31.8      13.3    10.6     -2.7
233.8
##  [20,]       46.4    53.2  39.6  31.1 31.1      22.9    20.9     -2.0
243.2
##  [21,]       42.6    49.1  36.1  29.3 31.1       5.5     5.3     -0.2
198.8
##  [22,]       27.7    33.0  22.3  22.3 30.9       3.7     4.9      1.2
146.0
```

```
##  [23,]       35.8    41.7  29.8  27.8 29.0      22.2    19.2     -3.0
202.5
##  [24,]       40.0    46.2  33.8  29.7 28.9      25.0    22.2     -2.8
223.0
##  [25,]       38.8    44.8  32.8  28.6 28.8      16.3    15.4     -0.9
204.6
##  [26,]       23.0    27.8  18.1  20.6 28.3       4.8     4.6     -0.2
127.0
##  [27,]       25.8    30.9  20.7  23.1 27.7      14.9    10.9     -4.0
150.0
##  [28,]       37.8    43.9  31.7  30.8 27.3      14.9    14.8     -0.1
201.1
##  [29,]       42.3    48.7  35.8  33.7 26.4       1.7     8.6      6.9
204.1
##  [30,]       44.7    51.3  38.2  34.8 26.1       9.9     7.4     -2.5
209.9
##  [31,]       49.8    57.0  42.7  38.7 25.7       9.3     7.6     -1.7
229.1
##  [32,]       29.4    34.8  24.0  28.0 25.3       7.2     7.3      0.1
156.1
##  [33,]       21.5    26.2  16.7  22.6 25.2       2.5     2.8      0.3
117.8
##  [34,]       39.7    46.1  33.3  36.8 23.7       3.5     4.2      0.7
188.0
##  [35,]       22.2    26.8  17.6  22.7 23.7       2.5     2.2     -0.3
117.4
##  [36,]       31.8    37.5  26.1  32.4 23.4       3.3     4.7      1.4
160.6
##  [37,]       24.2    29.4  19.0  28.3 23.3       1.9     7.1      5.2
138.4
##  [38,]       23.8    28.5  19.1  24.3 23.3      19.3    12.4     -6.9
143.8
##  [39,]       47.3    54.0  40.7  38.9 23.3       9.8    10.9      1.1
226.0
##  [40,]       35.6    41.5  29.8  33.5 23.3      15.8    13.0     -2.8
189.7
##  [41,]       26.1    31.1  21.0  27.4 23.1       2.5     3.0      0.5
134.7
##  [42,]       33.3    39.1  27.5  33.6 23.0       1.8     2.2      0.4
160.9
##  [43,]       31.6    37.2  26.0  32.7 22.6       8.3    10.9      2.6
171.9
##  [44,]       35.3    41.1  29.5  34.7 22.1      12.9     8.6     -4.3
179.9
##  [45,]       24.2    29.1  19.3  27.0 21.8      12.5     9.8     -2.7
141.0
##  [46,]       29.0    34.3  23.7  31.3 21.6       8.8     7.4     -1.4
154.7
##  [47,]       42.5    48.9  36.1  39.8 21.4      13.5     9.2     -4.3
207.1
```

```
##  [48,]       36.3    42.3  30.4  36.5 21.4       4.7     5.4      0.7
177.7
##  [49,]       31.8    37.6  26.0  36.5 20.8       1.7     3.0      1.3
158.7
##  [50,]       27.8    32.8  22.7  30.1 20.8       8.7     6.5     -2.2
147.2
##  [51,]       20.0    24.6  15.4  26.5 19.8      11.9     5.4     -6.5
117.1
##  [52,]       33.8    39.5  28.1  37.2 19.6       3.1     4.6      1.5
167.4
##  [53,]       28.8    34.2  23.4  34.7 19.6       0.7     2.1      1.4
144.9
##  [54,]       24.4    29.2  19.5  30.6 19.0       7.1     5.5     -1.6
133.7
##  [55,]       27.5    32.7  22.4  33.5 18.8       5.0     5.5      0.5
145.9
##  [56,]       36.5    42.4  30.6  39.5 18.8       6.0     7.6      1.6
183.0
##  [57,]       30.0    35.3  24.7  35.3 18.6       2.3     3.5      1.2
150.9
##  [58,]       28.0    33.1  22.9  33.3 18.5       2.9     5.2      2.3
146.2
##  [59,]       30.6    36.0  25.1  37.1 18.3       3.3     4.9      1.6
156.9
##  [60,]       33.1    39.0  27.2  40.6 18.3       0.3     2.5      2.2
163.2
##  [61,]       45.2    51.8  38.6  45.3 18.3       4.9     7.8      2.9
214.8
##  [62,]       21.4    26.0  16.8  28.5 18.2       5.9     5.0     -0.9
120.9
##  [63,]       31.4    37.2  25.7  39.8 18.0       1.8     2.1      0.3
156.3
##  [64,]       21.7    26.3  17.1  29.3 17.8      12.5     6.7     -5.8
125.6
##  [65,]       32.8    38.5  27.1  39.8 17.7      11.4    10.2     -1.2
176.3
##  [66,]       31.2    36.6  25.7  38.4 17.2       4.5     4.2     -0.3
157.5
##  [67,]       19.5    23.9  15.1  28.3 17.1       2.2     3.3      1.1
110.5
##  [68,]       38.6    45.1  32.1  46.6 17.0       3.1     2.9     -0.2
185.2
##  [69,]       31.1    36.5  25.7  38.7 16.9       2.2     4.2      2.0
157.3
##  [70,]       33.5    39.1  27.9  40.4 16.9       6.6     6.0     -0.6
169.8
##  [71,]       22.7    27.7  17.7  34.9 16.8       0.5     4.1      3.6
128.0
##  [72,]       22.2    26.9  17.5  31.7 16.8       2.3     3.8      1.5
122.7
```

```
##  [73,]       25.6    30.7  20.5  36.5 16.6       0.7     1.5      0.8
132.9
##  [74,]       27.3    32.7  22.0  39.3 15.9       1.3     3.2      1.9
143.6
##  [75,]       19.4    24.0  14.8  32.0 15.8       2.1     2.9      0.8
111.8
##  [76,]       26.2    31.3  21.1  37.7 15.8       0.7     2.9      2.2
137.9
##  [77,]       38.0    44.0  31.9  45.3 15.7       6.1     7.6      1.5
190.1
##  [78,]       41.8    48.2  35.5  48.1 15.7       5.9     5.9      0.0
201.1
##  [79,]       23.7    28.5  18.8  36.4 15.1       6.7     8.4      1.7
139.3
##  [80,]       22.1    26.8  17.4  34.5 14.7       5.3     3.9     -1.4
123.3
##  [81,]       39.2    45.3  33.2  47.7 14.5       1.1     3.9      2.8
187.7
##  [82,]       31.9    37.4  26.4  43.7 14.4       7.4     8.2      0.8
170.2
##  [83,]       19.8    24.2  15.5  31.2 14.4       1.3     2.9      1.6
110.9
##  [84,]       22.3    27.1  17.6  35.8 14.3       3.4     4.6      1.2
126.3
##  [85,]       20.4    24.9  15.9  33.2 14.3       0.1     0.9      0.8
110.5
##  [86,]       20.5    25.0  16.0  32.7 14.3       0.2     1.2      1.0
110.9
##  [87,]       24.0    28.8  19.2  36.8 14.1       8.2     6.8     -1.4
136.5
##  [88,]       20.5    25.4  15.6  38.8 13.8       0.8     2.0      1.2
118.1
##  [89,]       24.9    29.9  19.9  39.5 13.7       6.1     8.1      2.0
144.1
##  [90,]       30.1    35.5  24.8  43.3 13.6       1.3     4.3      3.0
155.9
##  [91,]       24.9    29.8  20.0  39.3 13.4       1.5     2.3      0.8
132.0
##  [92,]       29.1    34.4  23.8  44.1 13.0       0.9     2.0      1.1
148.4
##  [93,]       23.7    28.6  18.9  40.8 12.5       1.3     2.8      1.5
130.1
##  [94,]       26.0    31.1  20.9  43.6 12.3       1.9     2.9      1.0
139.7
##  [95,]       26.8    31.9  21.7  43.9 12.2       7.4     6.0     -1.4
148.5
##  [96,]       19.1    23.5  14.7  35.5 12.2       0.1     0.6      0.5
106.2
##  [97,]       23.8    28.6  19.0  40.2 12.1       3.8     3.1     -0.7
129.9
```

```
##  [98,]       17.9    22.4  13.4  37.2 11.9       0.3     1.3      1.0
105.4
##  [99,]       25.2    30.2  20.1  45.3 11.2       2.6     5.6      3.0
143.2
## [100,]       23.7    28.5  18.8  43.7 11.1       1.5     4.8      3.3
135.4
## [101,]       20.7    25.2  16.2  39.2 10.9       3.0     3.1      0.1
118.4
## [102,]       21.1    25.5  16.6  39.9 10.7       1.1     1.9      0.8
117.6
## [103,]       20.0    24.6  15.5  40.7 10.7       0.3     0.6      0.3
112.7
## [104,]       19.5    24.1  15.0  41.1 10.5       0.1     0.6      0.5
111.4
## [105,]       20.3    25.4  15.2  47.4 10.5       0.1     0.7      0.6
120.2
## [106,]       21.2    26.1  16.4  44.7 10.5       0.1     1.3      1.2
121.5
## [107,]       32.8    38.4  27.2  52.4 10.2       2.8     5.9      3.1
172.8
## [108,]       24.5    29.4  19.6  46.4 10.0       1.0     2.7      1.7
135.3
## [109,]       33.3    38.9  27.6  54.4  9.7       2.2     3.7      1.5
171.3
## [110,]       19.0    23.3  14.6  41.3  9.3       0.3     0.9      0.6
109.3
## [111,]       25.1    30.2  20.0  50.6  9.1       0.1     0.5      0.4
136.0
## [112,]       23.1    27.8  18.4  46.6  9.0       4.3     4.9      0.6
134.7
## [113,]       19.4    23.7  15.0  41.7  9.0       7.1     4.6     -2.5
118.0
## [114,]       19.8    24.2  15.5  44.3  8.1       0.1     0.7      0.6
113.3
## [115,]       28.6    34.2  23.1  57.4  8.0       0.5     1.4      0.9
154.1
## [116,]       24.3    29.3  19.3  52.6  7.9       0.1     0.8      0.7
135.0
## [117,]       16.8    21.9  11.8  53.9  7.6       0.2     2.1      1.9
116.2
## [118,]       16.4    20.6  12.1  46.0  6.9       0.1     1.6      1.5
105.2
## [119,]       17.6    21.9  13.2  47.1  6.9       0.1     0.5      0.4
107.7
## [120,]       32.0    37.7  26.3  62.3  6.8       0.6     3.3      2.7
171.7
## [121,]       20.6    25.2  15.9  53.3  6.3       0.1     0.1      0.0
121.5
## [122,]       17.8    22.3  13.4  51.0  6.1       0.7     3.0      2.3
116.6
```

```
## [123,]       19.1    23.4  14.7  51.7  5.5       0.3     1.6      1.3
117.6
## [124,]       19.4    24.1  14.6  57.5  5.4       0.1     0.2      0.1
121.4
## [125,]       19.8    24.2  15.4  55.4  4.8       0.1     1.1      1.0
121.8
## [126,]       16.5    20.6  12.4  51.0  4.6       0.6     1.3      0.7
107.7
## [127,]       22.9    27.5  18.2  60.7  4.3       1.7     3.4      1.7
140.4
## [128,]       18.0    22.4  13.5  58.3  4.2       0.1     0.8      0.7
118.0
## [129,]       15.2    19.6  10.8  58.7  4.0       0.1     0.2      0.1
108.7
## [130,]       15.2    19.3  11.2  53.4  4.0       0.1     0.1      0.0
103.3
## [131,]       20.4    24.8  15.9  60.1  3.9       0.7     2.4      1.7
129.9
## [132,]       18.7    23.2  14.2  61.7  3.7       0.1     0.5      0.4
122.5
## [133,]       18.5    22.7  14.3  58.2  3.6       0.1     0.5      0.4
118.3
## [134,]       16.8    21.7  12.0  66.1  3.5       0.1     0.4      0.3
120.9
## [135,]       15.2    19.1  11.3  56.7  2.9       0.3     0.5      0.2
106.2
## [136,]       16.4    20.4  12.4  57.7  2.9       0.1     0.5      0.4
110.8
## [137,]       14.6    18.5  10.7  58.0  2.7       0.1     0.3      0.2
105.1
## [138,]       15.9    20.0  11.8  63.5  2.4       0.1     0.4      0.3
114.4
## [139,]       17.8    22.0  13.5  65.4  2.4       0.1     0.1      0.0
121.3
## [140,]       14.7    18.7  10.6  65.8  1.9       0.1     0.4      0.3
112.5
## [141,]       16.5    20.8  12.2  69.6  1.9       0.1     0.1      0.0
121.2
## [142,]       15.4    19.5  11.3  66.7  1.9       0.1     0.1      0.0
115.0
## [143,]       14.1    18.0  10.2  64.3  1.7       0.1     0.5      0.4
109.3
## [144,]       14.9    18.9  10.9  67.5  1.6       0.1     0.1      0.0
114.0
## [145,]       13.5    17.4   9.7  65.2  1.5       0.1     0.1      0.0
107.5
## [146,]       14.1    18.5   9.6  74.6  1.5       0.1     0.1      0.0
118.5
## [147,]       14.2    18.0  10.3  66.8  1.5       0.1     0.2      0.1
111.2
```

```
## [148,]       16.6    20.8  12.5  72.1  1.4        0.1      0.4       0.3
124.2
## [149,]       13.7    17.4  10.0  67.9  1.1        0.1      0.1       0.0
110.3
## [150,]       13.0    16.6   9.3  69.5  0.9        0.1      0.1       0.0
109.5
## [151,]       12.8    16.6   9.1  72.5  0.9        0.1      0.1       0.0
112.1
## [152,]       13.5    17.1   9.8  69.2  0.9        0.2      0.7       0.5
111.9
## [153,]       13.5    17.2   9.7  71.7  0.9        0.1      0.1       0.0
113.2
## [154,]       13.0    16.6   9.4  69.5  0.9        0.1      0.2       0.1
109.8
## [155,]       12.2    16.1   8.3  75.7  0.8        0.1      0.1       0.0
113.3
## [156,]       12.9    16.6   9.2  72.8  0.7        0.1      0.1       0.0
112.4
## [157,]       11.7    15.3   8.2  77.6  0.4        0.1      0.1       0.0
113.4
## [158,]       12.3    15.9   8.7  79.2  0.4        0.1      0.1       0.0
116.7
## [159,]       13.5    17.4   9.5  82.3  0.4        0.1      0.1       0.0
123.3
## [160,]       11.4    15.1   7.7  80.6  0.4        0.1      0.1       0.0
115.4
## [161,]        9.9    13.7   6.1  84.9  0.3        0.1      0.1       0.0
115.1
## [162,]       10.2    14.0   6.4  83.7  0.3        0.1      0.1       0.0
114.8
## [163,]       11.4    14.7   8.0  81.4  0.2        0.1      0.1       0.0
115.9
## [164,]       12.5    16.0   8.9  85.2  0.2        0.1      0.1       0.0
123.0
## [165,]        8.8    12.6   5.1  89.4  0.1        0.1      0.1       0.0
116.2
## [166,]        9.4    12.8   6.1  89.7  0.1        0.1      0.1       0.0
118.3
## [167,]        9.6    13.3   5.8  90.2  0.1        0.1      0.1       0.0
119.2
## [168,]        8.5    12.4   4.6  89.5  0.1        0.1      0.1       0.0
115.3
## [169,]       11.1    14.8   7.5  91.3  0.1        0.1      0.2       0.1
125.2
## [170,]        9.2    12.4   5.9  91.3  0.0        0.1      0.2       0.1
119.2
## [171,]        1.2     3.3  -1.0 100.0  0.0         NA       NA       0.0
NA
## [172,]        1.1     3.2  -1.0 100.0  0.0         NA       NA       0.0
NA
```

```
## [173,]        1.3     3.8  -1.2 100.0  0.0       0.1     0.1      0.0
104.1
## [174,]        7.4    10.5   4.2  96.5  0.0       0.1     0.1      0.0
118.8
## [175,]        4.5     7.4   1.5  99.5  0.0       0.1     0.1      0.0
113.1
## [176,]        9.9    13.1   6.7  88.9  0.0       0.1     0.1      0.0
118.8
## [177,]        1.4     4.0  -1.2 100.0  0.0       0.1     0.1      0.0
104.4
## [178,]        0.7     2.1  -0.7 100.0  0.0        NA      NA      0.0
NA
## [179,]        9.3    12.6   6.1  90.8  0.0       0.1     0.1      0.0
119.0
## [180,]        4.3     6.6   2.0 100.0  0.0       0.1     0.1      0.0
113.1
## [181,]        1.5     4.3  -1.2 100.0  0.0       0.1     0.1      0.0
104.8
## [182,]        9.4    12.7   6.1  94.3  0.0       0.1     0.1      0.0
122.7
## [183,]        1.2     3.4  -1.0 100.0  0.0        NA      NA      0.0
NA
## [184,]        1.9     5.4  -1.5  99.6  0.0       0.1     0.1      0.0
105.6
## [185,]        0.7     2.2  -0.7 100.0  0.0        NA      NA      0.0
NA
## [186,]        6.7    10.1   3.3  96.4  0.0       0.1     0.1      0.0
116.7
## [187,]        3.2     5.6   0.9 100.0  0.0       0.1     0.1      0.0
109.9
## [188,]        7.7    10.9   4.6  95.7  0.0       0.1     0.1      0.0
119.1
## [189,]        1.6     4.4  -1.2 100.0  0.0        NA      NA      0.0
NA
## [190,]        1.8     4.9  -1.4  99.9  0.0       0.1     0.1      0.0
105.4
## [191,]        4.6     7.9   1.4  99.0  0.0       0.1     0.1      0.0
113.1
## [192,]        1.2     3.4  -1.0 100.0  0.0       0.1     0.1      0.0
103.8
## [193,]        2.0     5.6  -1.6  99.5  0.0       0.1     0.1      0.0
105.7
## [194,]        9.1    12.5   5.7  90.7  0.0       0.1     0.1      0.0
118.2
## [195,]        9.0    12.0   6.0  95.8  0.0       0.1     0.1      0.0
123.0
## [196,]        6.4     9.4   3.4  98.2  0.0       0.1     0.1      0.0
117.6
## [197,]        4.1     7.1   1.0  99.5  0.0       0.1     0.1      0.0
111.9
```

```
## [198,]        1.7     4.9  -1.5  99.8  0.0       0.1     0.1      0.0
105.1
## [199,]        1.9     5.1  -1.4  99.8  0.0       0.1     0.1      0.0
105.6
## [200,]        1.6     4.3  -1.2 100.0  0.0       0.1     0.1      0.0
104.9
## [201,]        8.9    12.3   5.5  93.8  0.0       0.1     0.1      0.0
120.7
## [202,]        3.7     7.1   0.3  99.2  0.0       0.1     0.1      0.0
110.5
## [203,]        3.1     6.2   0.0  99.7  0.0       0.1     0.1      0.0
109.2
## [204,]        2.5     5.4  -0.4  99.9  0.0       0.1     0.1      0.0
107.6
## [205,]       10.0    13.4   6.6  93.2  0.0       0.1     0.1      0.0
123.4
## [206,]        1.0     3.0  -1.0 100.0  0.0        NA      NA      0.0
NA
## [207,]        1.3     4.0  -1.3 100.0  0.0       0.1     0.1      0.0
104.2
## [208,]        0.8     2.2  -0.6 100.0  0.0        NA      NA      0.0
NA
## [209,]        8.9    12.2   5.7  95.5  0.0       0.1     0.1      0.0
122.5
## [210,]        1.3     3.7  -1.0 100.0  0.0       0.1     0.1      0.0
104.2
## [211,]        1.2     3.6  -1.2 100.0  0.0        NA      NA      0.0
NA
## [212,]        9.0    12.1   5.9  92.9  0.0       0.1     0.1      0.0
120.1
## [213,]        1.0     3.0  -1.0 100.0  0.0        NA      NA      0.0
NA
## [214,]        0.3     3.6  -2.9 100.0  0.0        NA      NA      0.0
NA
## [215,]        6.2     9.7   2.8  97.0  0.0       0.1     0.1      0.0
115.9
## [216,]        1.3     5.8  -3.2  98.5  0.0       0.1     0.1      0.0
102.6
## [217,]        1.5     4.0  -1.0 100.0  0.0       0.1     0.1      0.0
104.7
## [218,]        8.4    11.8   5.1  92.9  0.0       0.1     0.1      0.0
118.4
## [219,]        2.1     5.7  -1.5  99.7  0.0       0.1     0.1      0.0
106.2
## [220,]        7.5    10.6   4.3  96.2  0.0       0.1     0.1      0.0
118.8
## [221,]        4.4     7.7   1.1  99.2  0.0       0.1     0.1      0.0
112.6
## [222,]        5.0     8.2   1.9  99.5  0.0       0.1     0.1      0.0
114.8
```

```
## [223,]        9.6    13.1   6.1  94.6  0.0       0.1     0.1      0.0
123.6
## [224,]        1.4     4.1  -1.3 100.0  0.0       0.1     0.1      0.0
104.4
## [225,]        1.2     3.5  -1.1 100.0  0.0       0.1     0.1      0.0
103.8
## [226,]        2.9     6.4  -0.6  99.4  0.0       0.1     0.1      0.0
108.3
## [227,]        0.7     2.5  -1.1 100.0  0.0        NA      NA      0.0
NA
## [228,]        1.2     3.6  -1.1 100.0  0.0       0.1     0.1      0.0
103.9
## [229,]        8.0    11.0   5.0  96.1  0.0       0.1     0.1      0.0
120.3
## [230,]        1.4     4.1  -1.2 100.0  0.0       0.1     0.1      0.0
104.5
## [231,]        5.3     8.9   1.8  98.1  0.0       0.1     0.1      0.0
114.3
## [232,]        1.6     4.7  -1.4  99.9  0.0       0.1     0.1      0.0
105.0
## [233,]        1.6     4.7  -1.5  99.9  0.0       0.1     0.1      0.0
104.9
```

4. Loops in R are notoriously slow. While loops are incredibly important to master from a theoretical sense, when working with large data sets we should always try to use the apply family of functions to increase efficiency. You have learned about sapply and lapply in class, but until you learn how to write your own functions, sapply and lapply can be fairly limited. Today we will take a quick look at the power of the apply() function, which allows us to perform functions on 2 dimensional objects like matrices and dataframes. The apply() function has 3 main parameters: apply(X = , MARGIN = , FUN =). The only difference between apply() and sapply() is the MARGIN parameter which tells R whether you want to calculate something on the rows (MARGIN = 1) or the columns (MARGIN = 2)

```
#(a) Create a matrix that contains only the numerical values of boombust.csv
and name it names.
names<- as.matrix(boom[,2:9])

#(b) Create a new column at the end of names (similarly to how you were shown
in 3c).
names<- cbind(names, rep(0, length(names[,1])))
head(nums)

##      Projection Ceiling Floor Bust Boom Ownership Optimal Leverage
## [1,]       36.1    41.9  30.2  7.2 62.1      35.3    32.1     -3.2 241.7
## [2,]       40.3    46.6  34.0 10.1 58.1      24.9    21.1     -3.8 231.3
## [3,]       30.0    35.3  24.7 11.9 46.5      26.2    30.4      4.2 209.2
## [4,]       44.7    51.2  38.2 18.4 44.6      19.7    17.5     -2.2 232.1
## [5,]       47.3    54.1  40.6 19.5 44.6      17.3    18.1      0.8 242.3
## [6,]       43.4    50.1  36.7 20.1 43.2      26.7    27.4      0.7 248.3
```

```r
#(c) Use apply() to fill this new column with the sum of each row for columns
1 - 9. Hints: in the apply() function you should set X = names[, 1:9] and FUN
= sum. You cab set MARGIN equal to one.
names[,9]<- apply(X= names[,1:8], MARGIN = 1, FUN = sum)


#(d) Print out names
print(names)
```

```
##        Projection Ceiling Floor  Bust Boom Ownership Optimal Leverage
##   [1,]       36.1    41.9  30.2   7.2 62.1      35.3    32.1     -3.2
241.7
##   [2,]       40.3    46.6  34.0  10.1 58.1      24.9    21.1     -3.8
231.3
##   [3,]       30.0    35.3  24.7  11.9 46.5      26.2    30.4      4.2
209.2
##   [4,]       44.7    51.2  38.2  18.4 44.6      19.7    17.5     -2.2
232.1
##   [5,]       47.3    54.1  40.6  19.5 44.6      17.3    18.1      0.8
242.3
##   [6,]       43.4    50.1  36.7  20.1 43.2      26.7    27.4      0.7
248.3
##   [7,]       53.4    60.5  46.4  22.3 42.3      23.4    23.8      0.4
272.5
##   [8,]       31.2    36.9  25.5  16.4 41.7      12.1     6.7     -5.4
165.1
##   [9,]       44.8    51.4  38.1  21.2 41.5      21.9    20.5     -1.4
238.0
##  [10,]       25.8    31.0  20.6  14.1 41.1      15.2    13.7     -1.5
160.0
##  [11,]       37.3    44.1  30.4  22.8 40.5      27.5    17.4    -10.1
209.9
##  [12,]       33.8    39.5  28.0  18.6 39.2      16.9    17.5      0.6
194.1
##  [13,]       57.2    64.7  49.7  27.2 38.6      25.1    24.9     -0.2
287.2
##  [14,]       27.1    32.2  22.1  15.0 38.3      30.4    16.4    -14.0
167.5
##  [15,]       43.7    50.2  37.2  24.2 36.9      17.9    19.6      1.7
231.4
##  [16,]       31.9    37.4  26.4  18.9 36.5      28.8    11.6    -17.2
174.3
##  [17,]       49.9    57.1  42.8  27.6 36.3      14.4    12.8     -1.6
239.3
##  [18,]       28.5    33.9  23.0  20.0 34.9       1.0     5.2      4.2
150.7
##  [19,]       49.4    56.7  42.2  32.5 31.8      13.3    10.6     -2.7
233.8
##  [20,]       46.4    53.2  39.6  31.1 31.1      22.9    20.9     -2.0
243.2
```

```
##  [21,]       42.6    49.1  36.1  29.3 31.1       5.5     5.3     -0.2
198.8
##  [22,]       27.7    33.0  22.3  22.3 30.9       3.7     4.9      1.2
146.0
##  [23,]       35.8    41.7  29.8  27.8 29.0      22.2    19.2     -3.0
202.5
##  [24,]       40.0    46.2  33.8  29.7 28.9      25.0    22.2     -2.8
223.0
##  [25,]       38.8    44.8  32.8  28.6 28.8      16.3    15.4     -0.9
204.6
##  [26,]       23.0    27.8  18.1  20.6 28.3       4.8     4.6     -0.2
127.0
##  [27,]       25.8    30.9  20.7  23.1 27.7      14.9    10.9     -4.0
150.0
##  [28,]       37.8    43.9  31.7  30.8 27.3      14.9    14.8     -0.1
201.1
##  [29,]       42.3    48.7  35.8  33.7 26.4       1.7     8.6      6.9
204.1
##  [30,]       44.7    51.3  38.2  34.8 26.1       9.9     7.4     -2.5
209.9
##  [31,]       49.8    57.0  42.7  38.7 25.7       9.3     7.6     -1.7
229.1
##  [32,]       29.4    34.8  24.0  28.0 25.3       7.2     7.3      0.1
156.1
##  [33,]       21.5    26.2  16.7  22.6 25.2       2.5     2.8      0.3
117.8
##  [34,]       39.7    46.1  33.3  36.8 23.7       3.5     4.2      0.7
188.0
##  [35,]       22.2    26.8  17.6  22.7 23.7       2.5     2.2     -0.3
117.4
##  [36,]       31.8    37.5  26.1  32.4 23.4       3.3     4.7      1.4
160.6
##  [37,]       24.2    29.4  19.0  28.3 23.3       1.9     7.1      5.2
138.4
##  [38,]       23.8    28.5  19.1  24.3 23.3      19.3    12.4     -6.9
143.8
##  [39,]       47.3    54.0  40.7  38.9 23.3       9.8    10.9      1.1
226.0
##  [40,]       35.6    41.5  29.8  33.5 23.3      15.8    13.0     -2.8
189.7
##  [41,]       26.1    31.1  21.0  27.4 23.1       2.5     3.0      0.5
134.7
##  [42,]       33.3    39.1  27.5  33.6 23.0       1.8     2.2      0.4
160.9
##  [43,]       31.6    37.2  26.0  32.7 22.6       8.3    10.9      2.6
171.9
##  [44,]       35.3    41.1  29.5  34.7 22.1      12.9     8.6     -4.3
179.9
##  [45,]       24.2    29.1  19.3  27.0 21.8      12.5     9.8     -2.7
141.0
```

```
##  [46,]       29.0    34.3  23.7  31.3 21.6       8.8     7.4     -1.4
154.7
##  [47,]       42.5    48.9  36.1  39.8 21.4      13.5     9.2     -4.3
207.1
##  [48,]       36.3    42.3  30.4  36.5 21.4       4.7     5.4      0.7
177.7
##  [49,]       31.8    37.6  26.0  36.5 20.8       1.7     3.0      1.3
158.7
##  [50,]       27.8    32.8  22.7  30.1 20.8       8.7     6.5     -2.2
147.2
##  [51,]       20.0    24.6  15.4  26.5 19.8      11.9     5.4     -6.5
117.1
##  [52,]       33.8    39.5  28.1  37.2 19.6       3.1     4.6      1.5
167.4
##  [53,]       28.8    34.2  23.4  34.7 19.6       0.7     2.1      1.4
144.9
##  [54,]       24.4    29.2  19.5  30.6 19.0       7.1     5.5     -1.6
133.7
##  [55,]       27.5    32.7  22.4  33.5 18.8       5.0     5.5      0.5
145.9
##  [56,]       36.5    42.4  30.6  39.5 18.8       6.0     7.6      1.6
183.0
##  [57,]       30.0    35.3  24.7  35.3 18.6       2.3     3.5      1.2
150.9
##  [58,]       28.0    33.1  22.9  33.3 18.5       2.9     5.2      2.3
146.2
##  [59,]       30.6    36.0  25.1  37.1 18.3       3.3     4.9      1.6
156.9
##  [60,]       33.1    39.0  27.2  40.6 18.3       0.3     2.5      2.2
163.2
##  [61,]       45.2    51.8  38.6  45.3 18.3       4.9     7.8      2.9
214.8
##  [62,]       21.4    26.0  16.8  28.5 18.2       5.9     5.0     -0.9
120.9
##  [63,]       31.4    37.2  25.7  39.8 18.0       1.8     2.1      0.3
156.3
##  [64,]       21.7    26.3  17.1  29.3 17.8      12.5     6.7     -5.8
125.6
##  [65,]       32.8    38.5  27.1  39.8 17.7      11.4    10.2     -1.2
176.3
##  [66,]       31.2    36.6  25.7  38.4 17.2       4.5     4.2     -0.3
157.5
##  [67,]       19.5    23.9  15.1  28.3 17.1       2.2     3.3      1.1
110.5
##  [68,]       38.6    45.1  32.1  46.6 17.0       3.1     2.9     -0.2
185.2
##  [69,]       31.1    36.5  25.7  38.7 16.9       2.2     4.2      2.0
157.3
##  [70,]       33.5    39.1  27.9  40.4 16.9       6.6     6.0     -0.6
169.8
```

```
##  [71,]       22.7    27.7  17.7  34.9 16.8       0.5     4.1      3.6
128.0
##  [72,]       22.2    26.9  17.5  31.7 16.8       2.3     3.8      1.5
122.7
##  [73,]       25.6    30.7  20.5  36.5 16.6       0.7     1.5      0.8
132.9
##  [74,]       27.3    32.7  22.0  39.3 15.9       1.3     3.2      1.9
143.6
##  [75,]       19.4    24.0  14.8  32.0 15.8       2.1     2.9      0.8
111.8
##  [76,]       26.2    31.3  21.1  37.7 15.8       0.7     2.9      2.2
137.9
##  [77,]       38.0    44.0  31.9  45.3 15.7       6.1     7.6      1.5
190.1
##  [78,]       41.8    48.2  35.5  48.1 15.7       5.9     5.9      0.0
201.1
##  [79,]       23.7    28.5  18.8  36.4 15.1       6.7     8.4      1.7
139.3
##  [80,]       22.1    26.8  17.4  34.5 14.7       5.3     3.9     -1.4
123.3
##  [81,]       39.2    45.3  33.2  47.7 14.5       1.1     3.9      2.8
187.7
##  [82,]       31.9    37.4  26.4  43.7 14.4       7.4     8.2      0.8
170.2
##  [83,]       19.8    24.2  15.5  31.2 14.4       1.3     2.9      1.6
110.9
##  [84,]       22.3    27.1  17.6  35.8 14.3       3.4     4.6      1.2
126.3
##  [85,]       20.4    24.9  15.9  33.2 14.3       0.1     0.9      0.8
110.5
##  [86,]       20.5    25.0  16.0  32.7 14.3       0.2     1.2      1.0
110.9
##  [87,]       24.0    28.8  19.2  36.8 14.1       8.2     6.8     -1.4
136.5
##  [88,]       20.5    25.4  15.6  38.8 13.8       0.8     2.0      1.2
118.1
##  [89,]       24.9    29.9  19.9  39.5 13.7       6.1     8.1      2.0
144.1
##  [90,]       30.1    35.5  24.8  43.3 13.6       1.3     4.3      3.0
155.9
##  [91,]       24.9    29.8  20.0  39.3 13.4       1.5     2.3      0.8
132.0
##  [92,]       29.1    34.4  23.8  44.1 13.0       0.9     2.0      1.1
148.4
##  [93,]       23.7    28.6  18.9  40.8 12.5       1.3     2.8      1.5
130.1
##  [94,]       26.0    31.1  20.9  43.6 12.3       1.9     2.9      1.0
139.7
##  [95,]       26.8    31.9  21.7  43.9 12.2       7.4     6.0     -1.4
148.5
```

```
##  [96,]       19.1    23.5  14.7  35.5 12.2       0.1     0.6      0.5
106.2
##  [97,]       23.8    28.6  19.0  40.2 12.1       3.8     3.1     -0.7
129.9
##  [98,]       17.9    22.4  13.4  37.2 11.9       0.3     1.3      1.0
105.4
##  [99,]       25.2    30.2  20.1  45.3 11.2       2.6     5.6      3.0
143.2
## [100,]       23.7    28.5  18.8  43.7 11.1       1.5     4.8      3.3
135.4
## [101,]       20.7    25.2  16.2  39.2 10.9       3.0     3.1      0.1
118.4
## [102,]       21.1    25.5  16.6  39.9 10.7       1.1     1.9      0.8
117.6
## [103,]       20.0    24.6  15.5  40.7 10.7       0.3     0.6      0.3
112.7
## [104,]       19.5    24.1  15.0  41.1 10.5       0.1     0.6      0.5
111.4
## [105,]       20.3    25.4  15.2  47.4 10.5       0.1     0.7      0.6
120.2
## [106,]       21.2    26.1  16.4  44.7 10.5       0.1     1.3      1.2
121.5
## [107,]       32.8    38.4  27.2  52.4 10.2       2.8     5.9      3.1
172.8
## [108,]       24.5    29.4  19.6  46.4 10.0       1.0     2.7      1.7
135.3
## [109,]       33.3    38.9  27.6  54.4  9.7       2.2     3.7      1.5
171.3
## [110,]       19.0    23.3  14.6  41.3  9.3       0.3     0.9      0.6
109.3
## [111,]       25.1    30.2  20.0  50.6  9.1       0.1     0.5      0.4
136.0
## [112,]       23.1    27.8  18.4  46.6  9.0       4.3     4.9      0.6
134.7
## [113,]       19.4    23.7  15.0  41.7  9.0       7.1     4.6     -2.5
118.0
## [114,]       19.8    24.2  15.5  44.3  8.1       0.1     0.7      0.6
113.3
## [115,]       28.6    34.2  23.1  57.4  8.0       0.5     1.4      0.9
154.1
## [116,]       24.3    29.3  19.3  52.6  7.9       0.1     0.8      0.7
135.0
## [117,]       16.8    21.9  11.8  53.9  7.6       0.2     2.1      1.9
116.2
## [118,]       16.4    20.6  12.1  46.0  6.9       0.1     1.6      1.5
105.2
## [119,]       17.6    21.9  13.2  47.1  6.9       0.1     0.5      0.4
107.7
## [120,]       32.0    37.7  26.3  62.3  6.8       0.6     3.3      2.7
171.7
```

```
## [121,]       20.6    25.2  15.9  53.3  6.3        0.1      0.1       0.0
121.5
## [122,]       17.8    22.3  13.4  51.0  6.1        0.7      3.0       2.3
116.6
## [123,]       19.1    23.4  14.7  51.7  5.5        0.3      1.6       1.3
117.6
## [124,]       19.4    24.1  14.6  57.5  5.4        0.1      0.2       0.1
121.4
## [125,]       19.8    24.2  15.4  55.4  4.8        0.1      1.1       1.0
121.8
## [126,]       16.5    20.6  12.4  51.0  4.6        0.6      1.3       0.7
107.7
## [127,]       22.9    27.5  18.2  60.7  4.3        1.7      3.4       1.7
140.4
## [128,]       18.0    22.4  13.5  58.3  4.2        0.1      0.8       0.7
118.0
## [129,]       15.2    19.6  10.8  58.7  4.0        0.1      0.2       0.1
108.7
## [130,]       15.2    19.3  11.2  53.4  4.0        0.1      0.1       0.0
103.3
## [131,]       20.4    24.8  15.9  60.1  3.9        0.7      2.4       1.7
129.9
## [132,]       18.7    23.2  14.2  61.7  3.7        0.1      0.5       0.4
122.5
## [133,]       18.5    22.7  14.3  58.2  3.6        0.1      0.5       0.4
118.3
## [134,]       16.8    21.7  12.0  66.1  3.5        0.1      0.4       0.3
120.9
## [135,]       15.2    19.1  11.3  56.7  2.9        0.3      0.5       0.2
106.2
## [136,]       16.4    20.4  12.4  57.7  2.9        0.1      0.5       0.4
110.8
## [137,]       14.6    18.5  10.7  58.0  2.7        0.1      0.3       0.2
105.1
## [138,]       15.9    20.0  11.8  63.5  2.4        0.1      0.4       0.3
114.4
## [139,]       17.8    22.0  13.5  65.4  2.4        0.1      0.1       0.0
121.3
## [140,]       14.7    18.7  10.6  65.8  1.9        0.1      0.4       0.3
112.5
## [141,]       16.5    20.8  12.2  69.6  1.9        0.1      0.1       0.0
121.2
## [142,]       15.4    19.5  11.3  66.7  1.9        0.1      0.1       0.0
115.0
## [143,]       14.1    18.0  10.2  64.3  1.7        0.1      0.5       0.4
109.3
## [144,]       14.9    18.9  10.9  67.5  1.6        0.1      0.1       0.0
114.0
## [145,]       13.5    17.4   9.7  65.2  1.5        0.1      0.1       0.0
107.5
```

```
## [146,]       14.1    18.5   9.6  74.6  1.5       0.1     0.1      0.0
118.5
## [147,]       14.2    18.0  10.3  66.8  1.5       0.1     0.2      0.1
111.2
## [148,]       16.6    20.8  12.5  72.1  1.4       0.1     0.4      0.3
124.2
## [149,]       13.7    17.4  10.0  67.9  1.1       0.1     0.1      0.0
110.3
## [150,]       13.0    16.6   9.3  69.5  0.9       0.1     0.1      0.0
109.5
## [151,]       12.8    16.6   9.1  72.5  0.9       0.1     0.1      0.0
112.1
## [152,]       13.5    17.1   9.8  69.2  0.9       0.2     0.7      0.5
111.9
## [153,]       13.5    17.2   9.7  71.7  0.9       0.1     0.1      0.0
113.2
## [154,]       13.0    16.6   9.4  69.5  0.9       0.1     0.2      0.1
109.8
## [155,]       12.2    16.1   8.3  75.7  0.8       0.1     0.1      0.0
113.3
## [156,]       12.9    16.6   9.2  72.8  0.7       0.1     0.1      0.0
112.4
## [157,]       11.7    15.3   8.2  77.6  0.4       0.1     0.1      0.0
113.4
## [158,]       12.3    15.9   8.7  79.2  0.4       0.1     0.1      0.0
116.7
## [159,]       13.5    17.4   9.5  82.3  0.4       0.1     0.1      0.0
123.3
## [160,]       11.4    15.1   7.7  80.6  0.4       0.1     0.1      0.0
115.4
## [161,]        9.9    13.7   6.1  84.9  0.3       0.1     0.1      0.0
115.1
## [162,]       10.2    14.0   6.4  83.7  0.3       0.1     0.1      0.0
114.8
## [163,]       11.4    14.7   8.0  81.4  0.2       0.1     0.1      0.0
115.9
## [164,]       12.5    16.0   8.9  85.2  0.2       0.1     0.1      0.0
123.0
## [165,]        8.8    12.6   5.1  89.4  0.1       0.1     0.1      0.0
116.2
## [166,]        9.4    12.8   6.1  89.7  0.1       0.1     0.1      0.0
118.3
## [167,]        9.6    13.3   5.8  90.2  0.1       0.1     0.1      0.0
119.2
## [168,]        8.5    12.4   4.6  89.5  0.1       0.1     0.1      0.0
115.3
## [169,]       11.1    14.8   7.5  91.3  0.1       0.1     0.2      0.1
125.2
## [170,]        9.2    12.4   5.9  91.3  0.0       0.1     0.2      0.1
119.2
```

```
## [171,]        1.2     3.3  -1.0 100.0  0.0        NA      NA      0.0
NA
## [172,]        1.1     3.2  -1.0 100.0  0.0        NA      NA      0.0
NA
## [173,]        1.3     3.8  -1.2 100.0  0.0       0.1     0.1      0.0
104.1
## [174,]        7.4    10.5   4.2  96.5  0.0       0.1     0.1      0.0
118.8
## [175,]        4.5     7.4   1.5  99.5  0.0       0.1     0.1      0.0
113.1
## [176,]        9.9    13.1   6.7  88.9  0.0       0.1     0.1      0.0
118.8
## [177,]        1.4     4.0  -1.2 100.0  0.0       0.1     0.1      0.0
104.4
## [178,]        0.7     2.1  -0.7 100.0  0.0        NA      NA      0.0
NA
## [179,]        9.3    12.6   6.1  90.8  0.0       0.1     0.1      0.0
119.0
## [180,]        4.3     6.6   2.0 100.0  0.0       0.1     0.1      0.0
113.1
## [181,]        1.5     4.3  -1.2 100.0  0.0       0.1     0.1      0.0
104.8
## [182,]        9.4    12.7   6.1  94.3  0.0       0.1     0.1      0.0
122.7
## [183,]        1.2     3.4  -1.0 100.0  0.0        NA      NA      0.0
NA
## [184,]        1.9     5.4  -1.5  99.6  0.0       0.1     0.1      0.0
105.6
## [185,]        0.7     2.2  -0.7 100.0  0.0        NA      NA      0.0
NA
## [186,]        6.7    10.1   3.3  96.4  0.0       0.1     0.1      0.0
116.7
## [187,]        3.2     5.6   0.9 100.0  0.0       0.1     0.1      0.0
109.9
## [188,]        7.7    10.9   4.6  95.7  0.0       0.1     0.1      0.0
119.1
## [189,]        1.6     4.4  -1.2 100.0  0.0        NA      NA      0.0
NA
## [190,]        1.8     4.9  -1.4  99.9  0.0       0.1     0.1      0.0
105.4
## [191,]        4.6     7.9   1.4  99.0  0.0       0.1     0.1      0.0
113.1
## [192,]        1.2     3.4  -1.0 100.0  0.0       0.1     0.1      0.0
103.8
## [193,]        2.0     5.6  -1.6  99.5  0.0       0.1     0.1      0.0
105.7
## [194,]        9.1    12.5   5.7  90.7  0.0       0.1     0.1      0.0
118.2
## [195,]        9.0    12.0   6.0  95.8  0.0       0.1     0.1      0.0
123.0
```

```
## [196,]        6.4     9.4   3.4  98.2  0.0        0.1     0.1      0.0
117.6
## [197,]        4.1     7.1   1.0  99.5  0.0        0.1     0.1      0.0
111.9
## [198,]        1.7     4.9  -1.5  99.8  0.0        0.1     0.1      0.0
105.1
## [199,]        1.9     5.1  -1.4  99.8  0.0        0.1     0.1      0.0
105.6
## [200,]        1.6     4.3  -1.2 100.0  0.0        0.1     0.1      0.0
104.9
## [201,]        8.9    12.3   5.5  93.8  0.0        0.1     0.1      0.0
120.7
## [202,]        3.7     7.1   0.3  99.2  0.0        0.1     0.1      0.0
110.5
## [203,]        3.1     6.2   0.0  99.7  0.0        0.1     0.1      0.0
109.2
## [204,]        2.5     5.4  -0.4  99.9  0.0        0.1     0.1      0.0
107.6
## [205,]       10.0    13.4   6.6  93.2  0.0        0.1     0.1      0.0
123.4
## [206,]        1.0     3.0  -1.0 100.0  0.0         NA      NA      0.0
NA
## [207,]        1.3     4.0  -1.3 100.0  0.0        0.1     0.1      0.0
104.2
## [208,]        0.8     2.2  -0.6 100.0  0.0         NA      NA      0.0
NA
## [209,]        8.9    12.2   5.7  95.5  0.0        0.1     0.1      0.0
122.5
## [210,]        1.3     3.7  -1.0 100.0  0.0        0.1     0.1      0.0
104.2
## [211,]        1.2     3.6  -1.2 100.0  0.0         NA      NA      0.0
NA
## [212,]        9.0    12.1   5.9  92.9  0.0        0.1     0.1      0.0
120.1
## [213,]        1.0     3.0  -1.0 100.0  0.0         NA      NA      0.0
NA
## [214,]        0.3     3.6  -2.9 100.0  0.0         NA      NA      0.0
NA
## [215,]        6.2     9.7   2.8  97.0  0.0        0.1     0.1      0.0
115.9
## [216,]        1.3     5.8  -3.2  98.5  0.0        0.1     0.1      0.0
102.6
## [217,]        1.5     4.0  -1.0 100.0  0.0        0.1     0.1      0.0
104.7
## [218,]        8.4    11.8   5.1  92.9  0.0        0.1     0.1      0.0
118.4
## [219,]        2.1     5.7  -1.5  99.7  0.0        0.1     0.1      0.0
106.2
## [220,]        7.5    10.6   4.3  96.2  0.0        0.1     0.1      0.0
118.8
```

```
## [221,]        4.4     7.7   1.1  99.2  0.0       0.1     0.1      0.0
112.6
## [222,]        5.0     8.2   1.9  99.5  0.0       0.1     0.1      0.0
114.8
## [223,]        9.6    13.1   6.1  94.6  0.0       0.1     0.1      0.0
123.6
## [224,]        1.4     4.1  -1.3 100.0  0.0       0.1     0.1      0.0
104.4
## [225,]        1.2     3.5  -1.1 100.0  0.0       0.1     0.1      0.0
103.8
## [226,]        2.9     6.4  -0.6  99.4  0.0       0.1     0.1      0.0
108.3
## [227,]        0.7     2.5  -1.1 100.0  0.0        NA      NA      0.0
NA
## [228,]        1.2     3.6  -1.1 100.0  0.0       0.1     0.1      0.0
103.9
## [229,]        8.0    11.0   5.0  96.1  0.0       0.1     0.1      0.0
120.3
## [230,]        1.4     4.1  -1.2 100.0  0.0       0.1     0.1      0.0
104.5
## [231,]        5.3     8.9   1.8  98.1  0.0       0.1     0.1      0.0
114.3
## [232,]        1.6     4.7  -1.4  99.9  0.0       0.1     0.1      0.0
105.0
## [233,]        1.6     4.7  -1.5  99.9  0.0       0.1     0.1      0.0
104.9
```