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

1. 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"

1. 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

1. 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

#(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