CS544 Module 1 Assignment

The following sample data shows the scores of the students in an exam:

40, 88, 60, 23, 76, 51, 59, 99, 96, 34

Do the following using R code **with only a single expression** for each case unless specified otherwise. The solutions should be generic and work for **any length** of given data. You can assume there will be an even number of values in the given data.

Q1 (25 points)

a) Assign the above data as a *vector* in the same order to the variable ***scores***. Use the variable ***scores*** for the remaining problems.
b) Using the *length* function, compute how many students took the exam? Store the expression in the variable ***n*.** Use this variable for the remaining problems where required.
c) Using indexing, write the expression for accessing the first two items. Store the expression in the variable ***first_and_second*.**
d) Using indexing, write the expression for accessing the first and last items. Store the expression in the variable ***first_and_last.***
e) Using indexing, write the expression for accessing the middle two items. Store the expression in the variable ***middle_two.***

Sample output:

```
 [1] 10
 [1] 40 88
 [1] 40 34
 [1] 76 51
```

Q2 (25 points)

a) Use *mean(scores)* to compute the average of the data. Store the expression in the variable **avg_score**.
b) Using comparison operators, write the R expression for scores less than or equal to the mean of the data. Store the expression in the variable **below_avg.**
c) Using comparison operators, write the R expression for scores greater than the mean of the data. Store the expression in the variable **above_avg.**
d) Using the **sum** function, write the R expression for the number of scores less than or equal to the average of the data. Store the expression in the variable **count_below_avg.**
e) Using the **sum** function, write the R expression for the number of scores greater than the average of the data. Store the expression in the variable **count_above_avg.**

Sample output:

```
[1] 62.6
[1] TRUE FALSE  TRUE  TRUE FALSE  TRUE  TRUE FALSE FALSE  TRUE
[1] FALSE  TRUE FALSE FALSE  TRUE FALSE FALSE  TRUE  TRUE FALSE
[1] 6
[1] 4
```

Q3 (10 points)

a) Using logical indexing and the results from Q2), write the R expression for all the scores that are less than or equal to the average value of the data. Store the expression in the variable **scores_below_avg.**
b) Similarly, write the R expression for all the scores that are greater than the average. Store the expression in the variable **scores_above_avg.**

Sample output:
[1] 40 60 23 51 59 34
[1] 88 76 99 96

Q4 (10 points)

a) Using numeric indexing, write the R expression for the odd indexed values from the scores. Store the expression in the variable **odd_index_values**.
b) Similarly, write the R expression for the even indexed values from the scores. Store the expression in the variable **even_index_values**.

You must use the **seq** function to generate the numeric indices for the above.

Sample output:
[1] 40 60 76 59 96
[1] 88 23 51 99 34

Q5 (10 points)

a) Using the **paste** function with LETTERS, write the expression for the following output. Store the expression in the variable **format_scores_version1**.
You can assume there are no more than 26 values.
Sample output:
[1] "A=40" "B=88" "C=60" "D=23" "E=76" "F=51" "G=59" "H=99" "I=96" "J=34"

b) Similarly, using the **paste** function with LETTERS, write the expression for the following output. Store the expression in the variable **format_scores_version2**. Do not use the *rev* function.
Sample output:
[1] "J=40" "I=88" "H=60" "G=23" "F=76" "E=51" "D=59" "C=99" "B=96" "A=34"

Q6 (10 points)

a) Create a matrix with two rows using the ***scores*** data. The first half of the values belong to the first row of the matrix. Store the expression in the variable **scores_matrix.**
The code should work for any size input data.
You can assume that there are even number of values in scores.
Sample output:

```
     [,1] [,2] [,3] [,4] [,5]
[1,]   40   88   60   23   76
[2,]   51   59   99   96   34
```

b) Write the expression for displaying the first and last columns of the above matrix. The code should work for any size matrix. Store the expression in the variable **first_and_last_version1.**
Sample output:

```
     [,1] [,2]
[1,]   40   76
[2,]   51   34
```

Q7 (10 points)

a) Copy **scores_matrix** to the variable **named_matrix**.
Assign column names for the *named_matrix* as Student_1, Student_2,… and row names as Quiz_1, Quiz_2, ... The code should work for any size matrix, i.e., for any number of columns in the matrix and any number of rows. The code can contain multiple statements.
Sample output:

```
       Student_1 Student_2 Student_3 Student_4 Student_5
Quiz_1        40        88        60        23        76
Quiz_2        51        59        99        96        34
```

b) Show the result for displaying the first and last columns of the *named_matrix*. The code should work for any size matrix. Store the expression in the variable **first_and_last_version2.**
Sample output:

```
       Student_1 Student_5
Quiz_1        40        76
Quiz_2        51        34
```

Submission:

- You must work on your assignments individually. You are not allowed to copy the answers from the others.
- Each assignment has a strict deadline. Please plan accordingly to submit on time.
- When the term *lastName* is referenced, please replace it with your last name.
- Provide all R code in a single file, **CS544_HW1_lastName.R**. Clearly mark each subpart of each question.
- Provide the corresponding code and outputs from the R console in a single PDF document, **CS544_HW1_lastName.pdf**
- Upload the two files to the Assignments section of Blackboard.

Note: <u>Only ONE submission is allowed. Please be sure that what you are submitting is your final submission.</u>