

Due : September 7, 2017

Name:

PUID:

*Instruction: Please submit your R code along with a brief write-up of the solutions (do not submit raw output). Some of the questions below can be answered with very little or no programming. However, write code that outputs the final answer and does not require any additional paper calculations. For example, suppose I ask for how many numbers are greater than 5 in the vector, $x=c(1,9,2,8,10,12)$. Do not simply count the number of **TRUE**s by hand, instead let the R count the number of **TRUE**s by coding **sum** ($x > 5$) or **length**($x[x > 5]$).*

Q.N. 1) Calculate the following numerical results to the three decimal places

- a) $(7 + 8) + 5^3 - 5 \div 6 + \sqrt{62}$
- b) $\ln 3 + \sqrt{2} \sin(\pi) - e^3$
- c) $2 \times (5 + 3) - \sqrt{6} + 9^2$
- d) $\ln 5 - \exp(2) + 2^3$
- e) $(9 \div 2) \times 4 - \sqrt{10} + \ln 6 - \exp(1)$
- f) $\log 14 + \ln 14 + (47 \bmod 5)$

Q.N. 2) Create the following vectors

- a) The vector consisting of the decreasing sequence of consecutive integers from 50 to -5.
- b) The vector of first 100 positive integers, without the perfect squares.
- c) The vector of the factorial values of 0 to 10.
- d) V1= 1 1 1 1 2 2 2 2 3 3 3 3 4 4 4 4 5 5 5 5
- e) V2= MATH, MATH, STAT, STAT, STAT, STAT, STAT, ECE,ECE,ECE, BIO,BIO

Q.N. 2) Create the following matrix (M) with the column and row names (Note that the numbers are in sequence from 1 to 20)

```
>M
```

	column-1	column-2	column-3	column-4	column-5
Experiment.1	1	5	9	13	17
Experiment.2	2	6	10	14	18
Experiment.3	3	7	11	15	19
Experiment.4	4	8	12	16	20

- a) Determine the dimension of the matrix M
- b) Select the first two row of the matrix M
- c) Calculate the sum of all columns of the matrix M
- d) Calculate the sum of all rows of the matrix M
- e) Use "sample" to shuffle the elements of each row of the matrix M

Q.N. 4) Test scores of Fifteen students in Test 1 and Test 2 are presented below

S.N.	Test 1	Test2
1	56	86
2	78	67
3	87	78
4	89	89
5	95	87
6	98	67
7	NA	94
8	78	78
9	87	81
10	98	83
11	54	78
12	89	NA
13	78	93
14	98	98
15	97	100

- How many students have their test 1 score greater than 80 ?
- How many students have their test 2 score greater than 85 ?
- Did all fifteen students take both tests?
- How many students did better in the second test than the first test?
- How many students have the same score in the first and second test?

Q.N. 5) Use R to solve the following system of equations:

$$\begin{aligned}
 x_1 + 2x_2 - x_3 + 3x_4 - x_5 &= 0 \\
 x_1 - 3x_2 + x_3 + 2x_4 - x_5 &= -9 \\
 2x_1 + x_2 + x_3 - 3x_4 + x_5 &= 12 \\
 x_1 - x_2 + 2x_3 + x_4 - x_5 &= 1 \\
 2x_1 + x_2 - x_3 + 2x_4 + x_5 &= -2
 \end{aligned}$$

Q.N. 6) The Fibonacci sequence is a famous sequence in mathematics. The first two elements are defined as [1, 1]. Subsequent elements are defined as the sum of the preceding two elements. For example, the third element is 2 (= 1+1), the fourth element is 3 (= 1+2), the fifth element is 5 (= 2+3), and so on. Print first 50 Fibonacci numbers.

Hint: To obtain the first 10 Fibonacci numbers in R, we can use

```

> Fibonacci <- numeric(10)
> Fibonacci[1] <- Fibonacci[2] <- 1
> for (i in 3:10) Fibonacci[i] <- Fibonacci[i - 2] + Fibonacci[i - 1]
> Fibonacci
[1] 1 1 2 3 5 8 13 21 34 55

```

Q.N. 7) Create the following data frame

	Age	Height	Weight	Sex
Joe	26	175	157	F
Nina	31	165	139	M
Mark	23	190	163	F
Sonia	52	179	155	M
Martha	76	163	170	M
Andrew	39	183	183	F
Marcie	26	164	153	M

- a) It appears that the categorical variable Sex has been recorded incorrectly. Invert Sex for all individuals.
- b) Sort the data in increasing order of Age.
- c) Sort the data in descending order of Age.