

CHAPMAN University
 Department of Computational and Data Sciences
 CS501 Introductory Computation for Scientists
 Fall 2019
 Homework#9

Date Given: Oct 16, 2019

Due Date: Oct 22, 2019

Download R software from CRAN (www.r-project.org) and install it on your computer.

Download RStudio software (www.rstudio.com) and install it on your computer.

There are 10 problems in this homework assignment. Solve these problems using R software. Make sure that the answer computed by your R-code matches with the given answers.

1. Evaluate the following expressions in R. Make sure that the answers generated by your R code matches with the given answers. (Lesson 9.11, Slide#4)

$$x = 5 + 8i$$

$$y = -6 + 7i$$

$$a) \quad u = x + y$$

$$b) \quad v = xy$$

$$c) \quad w = x / y$$

$$d) \quad z = e^x$$

$$e) \quad r = \sqrt{y}$$

$$f) \quad s = xy^2$$

Answers:

```
[a] -1+15i
[b] -86-13i
[c] 0.3058824-0.9764706i
[d] -21.5941+146.8338i
[e] 1.268768+2.758582i
[f] 607-524i
```

2. Use R to compute the following expressions. Make sure that the answers generated by your R code matches with the given answers. (Lesson 9.11, Slide#4)

$$a) \quad (3 + 6i)(-7 - 9i)$$

$$b) \quad \frac{5 + 4i}{5 - 4i}$$

$$c) \quad \frac{3}{2i}$$

Answers:

```
[a] 33-69i
[b] 0.2195122+0.9756098i
[c] 0-1.5i
```

3. Use R to calculate the following expressions. Make sure that the answers generated by your R code matches with the given answers. (Lesson 9.12, Slide #6, #8)

- a) $e^{(-2.1)^3} + 3.47 \log(14) + \sqrt[4]{287}$
- b) $(3.4)^7 \log(14) + \sqrt[4]{287}$
- c) $\cos^2\left(\frac{4.12\pi}{6}\right)$
- d) $\cos\left(\frac{4.12\pi}{6}\right)^2$

Answers:

```
[a] 8.093113
[b] 6023.964
[c] 0.3062422
[d] -0.05872703
```

4. Suppose that $x = 6$. Find the results of the following operations. Make sure that the answers generated by your R code matches with the given answers. (Lesson 9.12, Slide#13)

- a) $z = (x < 10)$
- b) $z = (x == 10)$
- c) $z = (x >= 4)$
- d) $z = (x != 7)$

Answers:

```
[a] TRUE
[b] FALSE
[c] TRUE
[d] TRUE
```

5. Find the results of the following operations. Make sure that the answers generated by your R code matches with the given answers. (Lesson 9.12, Slide#18)

- a) $z = 6 > 3 + 8$
- b) $z = 6 + 3 > 8$
- c) $z = 4 > (2 + 9)$
- d) $z = (4 < 7) + 3$
- e) $z = 4 < 7 + 3$
- f) $z = (4 < 7) * 5$
- g) $z = 4 < (7 * 5)$
- h) $z = 2/5 >= 5$

Answers:

```
[a] FALSE
[b] TRUE
[c] FALSE
[d] 4
[e] TRUE
[f] 5
[g] TRUE
[h] FALSE
```

6. Enter this matrix in R. (Lesson 9.11, Slide#14)

$$\mathbf{A} = \begin{bmatrix} 3 & 7 & -4 & 12 \\ -5 & 9 & 10 & 2 \\ 6 & 13 & 8 & 11 \\ 15 & 5 & 4 & 1 \end{bmatrix}$$

- a) Create a vector V consisting of the elements in the second column of A.
 - b) Create a vector W consisting of the elements in the second row of A.
7. Store 20 random numbers with normal distribution and mean of 10 and standard deviation of 5 in a vector. Sort the vector. Remove the smallest 2 and the largest 2 elements from this vector. (Lesson 9.13, Slide#4)
8. Read the 'temperature.csv' file. This file contains the following data.
- High and low temperature (degree centigrade)
 - Rainfall (centimeters)
 - Month (from 1 to 12)
 - Year (for 20 years - from 1987 – 2005)

The first 6 lines of this file are as follows.

temperature	lower	rain	month	yr
10.8	6.5	12.2	1	1987
10.5	4.5	1.3	1	1987
7.5	-1	0.1	1	1987
6.5	-3.3	1.1	1	1987
10	5	3.5	1	1987

This file contains 6,940 lines of data.

- Compute the following statistics of temperature and rainfall data. (Lesson 9.13, Slide#7)
- Mean, Max, Min, Standard deviation, Variance, Range
9. Using the text file of problem 8, compute the yearly average temperature for all the years (from 1987 – 2005). Which was the coldest year (year in which the average temperature was the lowest) and which was the warmest? (Lesson 9.13, Slide #7,#8,#9)
10. Store 100 random numbers with normal distribution and mean of 50 and standard deviation of 50 in a vector. Plot this histogram. (you will see the bell-shaped Gaussian curve). Which number is the closet to the number 100? (Lesson 9.13 Slide #11).