

# STAT 280 B: Statistical Programming

Instructor: H Pezeshk

**Assignment 2 [Posted: Tuesday January 30, 2024]**

**Due: 8:00pm Tuesday February 6, 2024**

Suggested exercises from textbook: A first course in statistical programming with R, Third Edition. Braun, W. J., & Murdoch, D. J. (2021). Cambridge University Press.

## Instructions

- Students should upload their solutions on Moodle before due date. Late submissions will not be accepted.
- Solutions should be uploaded as a single PDF.
- Make sure to clearly state the problem number in your solutions. Always show the code used to solve an exercise (not the output only, unless explicitly stated) and comment on your code by using `#` where appropriate.
- Readability of code and clarity of presentation will be taken into account when marking.

## Textbook problems

- Section 2.3; Problems **10**, **11** and **12** on page 22:  
(**Problem 10** "Create the vector, ... to obtain the factor ...").  
(**Problem 11** "Use the `more.colors`, ..., to create the vector...").  
(**Problem 12** "Convert the character, ..., label to "turquoise"").
- Section 2.7; Problems **1** and **5** on page 39:  
(**Problem 1** "Use R to identify, ..., the sequence  $\{1^3, 2^3, \dots, 15^3\}$ ").  
(**Problem 5** "Evaluation of a square root, ..., correct answer but without the warning.").

## Additional problems

**1. Sequences.** Generate the following sequences using `seq()` and `rep()`:

- a. 2, 4, 6, 8, ..., 22.
- b. 1, 5, 25, 125, ..., 9765625.
- c. 11, 12, 13, 11, 12, 13, ... 13, 11, 12, 13 (each entry appearing 7 times).

d. 1, 1, 1, 2, 2, 2, ..., 6, 6, 6.

e. 60, 47, 44, ..., 14, 12.

f. 1, 2, 5, 10, 20, 50, 100, 200, 500, 1000, 2000, 5000, 10000, 20000, 50000.

**2. Arithmetic** Create a vector containing each of the following sequences:

a.  $\tan(\frac{\pi n}{7})$ , for  $n = 0, 1, 2, \dots, 10$ .

b. 1, 4, 23, 122, 621, 3120, 15619, 78118, 390617, .

c.  $3^n - 3n$ , for  $n = 0, 1, 2, \dots, 10$ .

d.  $5n \bmod 3$ , for  $n = 0, 1, 2, \dots, 10$ . (i. e. the remainder of  $3n/7$  for  $n = 0, 1, 2, \dots, 10$ ).

e. Let

$$S_n = \sum_{i=1}^n \frac{(-1)^{i+1}}{2i-1} = 1 - \frac{1}{3} + \frac{1}{5} - \frac{1}{7} + \dots + \frac{(-1)^{n+1}}{2n-1}.$$

It can be shown that  $\lim_n S_n = \pi/4$ .

Evaluate  $4S_{10}$ ,  $4S_{100}$  and  $4S_{1000}$ . (Hint: use the `sum()` function).

Credits: Some problems by Prof. Robin Evans (Oxford).