

## CSC 6013 – Summer 2022

### Week 4 Coding Assignment

Create an algorithm to solve each problem, implement your algorithm in Python code as a function with the indicated input parameters and return value, and run it on the two problem instances. For each instance, also print out the value returned by the function call.

Submit your work – code and output - as a docx or pdf file through Canvas.

1) Find the number of entries in an array of integers that are divisible by a given integer. Your function should have two input parameters – an array of integers and a positive integer – and should return an integer indicating the count.

Run your algorithm on the problem instances:

a) <20, 25, 30, 35, 40, 45, 50, 55, 60, 65 > number of entries that are divisible by 3

and

b) <18, 45, 77, 81, 33, 54, 99> number of entries that are divisible by 9

2) Given an array of real numbers, without sorting the array, find the smallest gap between all pairs of elements (for an array A, the absolute value of the difference between elements  $A_i$  and  $A_j$ ). Your function should have one input parameter – an array of numbers – and should return a non-negative number indicating the smallest gap.

Run your algorithm on the problem instances:

a) <40, 110, 250, 90, 10, 350, 190>

b) <12.3, 45.6, 0, 78.9, -3.21, 5.99>.

3) Given an integer  $n \geq 2$  and two  $n \times n$  matrices A and B of real numbers, find the product AB of the matrices. Your function should have three input parameters – a positive integer n and two  $n \times n$  matrices of numbers– and should return the  $n \times n$  product matrix.

Run your algorithm on the problem instances:

a)  $n=2$ ,  $A = \begin{pmatrix} 2 & 7 \\ 3 & 5 \end{pmatrix}$ ,  $B = \begin{pmatrix} 8 & -4 \\ 6 & 6 \end{pmatrix}$

b)  $n=3$ ,  $A = \begin{pmatrix} 1 & 0 & 2 \\ 3 & -2 & 5 \\ 6 & 2 & -3 \end{pmatrix}$ ,  $B = \begin{pmatrix} .3 & .25 & .1 \\ .4 & .8 & 0 \\ -.5 & .75 & .6 \end{pmatrix}$

If you are not familiar with matrix multiplication, you might find the following internet resources helpful. (Thanks to Dr. Paulo Fernandes for these references.)

The definition of matrix multiplication from Wikipedia:

[https://en.wikipedia.org/wiki/Matrix\\_multiplication](https://en.wikipedia.org/wiki/Matrix_multiplication)

A simpler definition of matrix multiplication:

<https://www.mathsisfun.com/algebra/matrix-multiplying.html>

Two videos of matrix multiplication:

<https://youtu.be/sYIOjyPyX3g>

<https://youtu.be/n8ICyS8CKIQ>

An automatic calculator that will multiply two matrices that you provide:

<https://matrix.reshish.com/multiplication.php>