

Assignment of SIT102 (Introduction to Programming)

For SWU students only

Due: 11:59pm (Melbourne time) of 15-Dec-2021 (Three weeks after the first release)

Notes: This is an individual assignment. The aim of the assignment is that the student applies concepts, techniques studied in SIT102 to solve problems about sorting array and solving equation.

Since this is a purely programming assignment, you do not need to hand-write your answers. Your solution must include your understanding to the problem (what method you used to solve this problem from a high-level-point-of-view), and all your codes to obtain the answers (just copy-paste, and no screenshot or handwritten is allowed), as well as the screenshot to show the console output of your final answer. Use **English** only when preparing your answer.

Submissions of a file or multiple files that do not follow the above instructions won't be marked (i.e., marked as 0 immediately). Late submission will incur 10% loss in marks per day, submissions late by 5 or more days will be marked as 0 (i.e., you will lose 10 marks per day if you are late for < 5 days, you will get 0 for being late with ≥ 5 days).

Q1. (60 marks) You are asked to sort the array obtained as follows with two different methods.

- 1. Ignoring all the letters in your student ID, use the last **FOUR DECIMAL DIGITS** of your ID as the seed to generate random numbers within $[1, 100]$ for the elements of the array. For example, if your ID is *SWU12345678*, then the seed is 5678.
- 2. Generate an array with a length len equal to the (last **TWO DIGITS** modulo 20). If $len \leq 5$, please update len as $len + 10$. Say your ID is *SWU12345661*, then $61 \bmod 20 = 1$, the value of len should be 11.

Say 0 stands for ascending and 1 stands for descending. With the random array of size len available, sort this array using two different methods:

- 1. Use the **FIRST DIGIT** of your ID, and sort the array according to the order of (**FIRST DIGIT** mod 2). For example, your ID is *SWU12345678*, because $1 \bmod 2 = 1$, you need to sort the array according to the descending order.
- 2. For the second method, you must sort it with an order different from the one used in the first method, i.e., if the first order is descending then the order here is ascending. And you must apply a recursive method for your sorting function.

Q2. (40 marks) Play with your student ID, and obtain a quadratic polynomial (polynomial of degree 2) $f(x) = ax^2 + bx + c$ as follows:

- 1. Ignoring all the letters in your student ID, use the right-most **FOUR DECIMAL DIGITS** of your ID as the seed to generate 3 random numbers (a.k.a, a triple) within $[1, 100]$ in order, and use them as a, b, c , respectively.
- 2. For the obtained values of a, b, c , check whether root(s) exist for the quadratic equation $f(x) = 0$. If not, you need to get more triples from random number generator until you hit the first tripe such that the root(s) of $f(x) = 0$ exist.

For the above obtained quadratic equation $f(x) = 0$, use the Newton-Raphson method to find the approximate root(s).