210CT Week 0 Tasks
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LEARNING OUTCOMES

This lab is associated to Week 0 as it comes before the first lecture which takes placed on Friday. There is no learning outcome per say, however, you should aim in the 4 hours of lab you have to re-familiarise yourself with the programming language of choice (probably Python or C++ for the majority of you). You had a pretty long summer and I'm sure some of the concepts are rusty! ☺

BASIC/INTERMEDIATE TASKS

1. Write a program which reads the integer numbers a, b, c, d from the keyboard and outputs the highest value of the fractions a/b and c/d. Input: a = 30, b = 6, c = 20, d = 10 Output: 5

2. Write a program which reads the planar coordinates of the vertices of a triangle, and then describes the relative position (above, below, left or right) of this triangle in relationship with a point in the same plane, given by its coordinates. Input: a = (3,4), b = (0,5), c = (6,9), p = (-2,4) Output: Left

3. Using conditional expressions, write a program which reads a float value for x from the keyboard and then computes the value for the function f(x). Input: x = 2 Output: f(x) = 14

$$f(x) = \begin{cases} x^2 + 4x + 4 & if \quad x < -2 \\ 0 & if \quad x = 0 \\ x^2 + 5x & if \quad x > -2 \end{cases}$$

4. Write a function to delete a substring from a given character string, specifying the beginning position and the length of the substring. Input: s = "beautiful", b = 3 (0 start), l = 2 Output: s = "beaiful"

5. Given three positive integers, representing a year, a month and a day-of-the-month respectively, write a function to compute the number of the day in the year, and the number of days to the end of that year. Input: 25 9 2016 Output: Passed 268 , Left 98

6. A list of numbers is read from the standard input. Find and display the minimum and the maximum value of this list, as well as their positions in the list. Input: [1,4,6,7,2] Output: Max is 7 on position 4, Min is 1 on position 1.

ADVANCED TASK

Given a system of N equations with N unknown variables, write a program to solve this system using a numeric method. Input: 2x + y + 3z = 14, x – y + z = 4, x + 3y – z = 2 Output: x = 2, y = 1, z = 3

Hint: Store all coefficients of the variables on the left hand side in a matrix and the equations' solution in a column vector. The overall system solution can be found using the formula: x = inv(A)*B, where A is the left hand side coefficient matrix and B is the right hand side solution vector column. Note: This method only works

if there is one solution to the system.

READING

Strachey, C. (2000). Fundamental Concepts in Programming Languages. *Higher-Order and Symbolic Computation,* 13, pp. 11-49.