ME1 Computing- Session 3: I/O Files and Conditional Loop

Learning outcomes:

- Being able to read and write data from/into a file.
- Being able to use appropriately conditional loops.
- Consolidating on counted loops.

Please provide feedback at: www.menti.com with code 7394 6262

Before you start

In your H drive create a folder *H:\ME1MCP\Session3* and work within it.

Task A: Consolidating Counted Loops

1. Write a script to find out the sum:

$$S = \sum_{n=1}^{N} n^2$$

   Input the number of terms *N* from the keyboard.

2. Write a script to throw *N* times a dice and compute the overall score.

3. The factorial of an integer number is the product of the number with all the integers below it, i.e.:

$$F = n! = n * (n-1) * (n-2) * (n-3) * \ldots\ldots * 3 * 2 * 1$$

   Write a script to compute the factorial of an integer number.

Answer Question 1

Task B: I/O Files

1. Download the files *CIDs.*txt and *Marks.txt* from Blackboard. The first file stores CIDs numbers of some students, whilst the second file stores their corresponding marks. Write a script to compute the average mark and to find the maximum mark (do not use implicit functions such as *sum()* and *max()*).

Answer Question 2

Task C: Searching values in a list

Using the same data imported from files in Task B:

1) Write a script to search and display the score of a student, specifying their CID from the keyboard.
2) Amend the script in Task B to display the list of students who achieved the maximum mark. Save the list into the file *Best.txt.*

Answer Question 3

Task D: Series expansion

1. The function $y(x) = \frac{1}{1-x}$ can be represented by the series expansion:

$$y(x) = \frac{1}{1-x} = \sum_{i=0}^{N\to\infty} x^i = 1 + x + x^2 + x^3 + x^4 + \cdots$$

in the interval $-1 < x < 1$ only.

Write a script to evaluate the function *y(x)* in the range *x = [-0.8 0.8]* with step *0.01*, for values of *N = 2, 6, 10, 14*.

Plot, on the same graph, *y(x)* vs *x* in the specified range *x = [-0.8 0.8]*, for each value of N.

Evaluate the analytical value of *y(x)* in the same range of *x* and plot it, to compare the exact function with the truncated series.

Answer Question 4

Task E: Series expansions

1. Given the series in Task D write a script to calculate a finite approximation of such function at a given point x_p, i.e. $y(x_p)$.

   Add terms of the series until the approximation reaches a given accuracy.

   The accuracy is reached when $|y_{n+1} - y_n| < 10^{-Q}$.

   Input the values of x_p and the accuracy *Q* from the keyboard.

   Evaluate the exact value of $y(x_p)$, and display the error from the computed value. Observe the value of the error against 10^{-Q}.

Answer Question 5