ME1 Computing- Session 3: Consolidating Counted Loops and Conditional Flow

Learning outcomes:

- Being familiar with counted loops
- Apply conditional statements logically

Please provide feedback at: www.menti.com with code 63 53 57

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 that displays N time the mantra "*I need to comment my scripts. Comments are marked too!*".

2. Write a script to find out the sum:

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

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

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

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

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

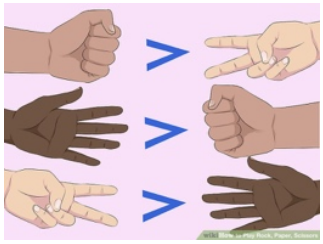
   Write a script to compute the factorial of an integer number.

Answer Question 1

Task B: Conditional flow

1. Two people intend to play dice. Input from the keyboard the names of these two people. Throw the dice once for each person. Establish who is the winner. Display the winner in the format 'Player X wins player Y'.

2. The same two people throw the dice *N* times. Amend the previous script to allow so and count the winning games (not the scores) for each person. At the end display the winner in the format 'Player X won x games, player Y won only y games'.

3. **Rock, Paper, Scissors**

(If you do not know this game, ask another student). Write a program to play the game between you and the computer.
The program should prompt the user for an input (either 1, 2 or 3) representing rock, paper or scissors, respectively. Then, the program should create a random result: use the function *random* to create random numbers 1, 2 or 3, which represent rock, paper or scissors, respectively.

Answer Question 2

Task C: Finding Pi

1. The value of π can be determined numerically by using a technique based on random numbers.
   - Consider a circle, of diameter 1, inscribed into a square.
   - The area of the circle is $\pi/4$.
   - The area of the enveloping square is 1.
   - Consequently, the ratio of the area of the circle to the area of the square will be $\pi/4$.

   The area of the square can be represented with a set of *N* random spatial points generated within the enveloping square. Some of these points, *Nc*, will reside into the circle too, and would therefore represent the area of the circle. Write a script to estimate the value of π with a number *N* of points. Run the script for various *N* = 1, 10, 100, 1000, 10k, 100k, 1M 10M 100M, and observe how the precision of the computed value for π varies with *N*.

2. Amend the above script to plot all the random points generated. Plot in red the points laying within the circle and in blue the ones laying outside the circle. Repeat the runs for the various *N* = 100, 1000, 10k. The plot will make more explicit the concept beyond the method.

Answer Question 3

Task D: Prime numbers

1. Generate a list with all the prime numbers up to *N*. (Input the value of *N* from the keyboard).

Answer Question 4