

ME1 Computing- Session 2 Counted Loops and Conditional Flow; Maths and Plotting functions

Learning outcomes:

- Understand the basic concepts of loop by traversing a list
- Being familiar with counted loops
- Apply conditional statements logically

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

Before you start

In your H drive create a folder `H:\ME1MCP\Session2` and work within it.

Task A: Generating lists

1. Generate a list A of $N = 100$ elements, containing the integer numbers from 1 to 100.
2. Create a second list B that contains the squared values of the elements of A.
3. Sum up the two lists together into a new list C.

A	1	2	3	4	5	6	7	- - -	99	100
B	1	4	9	16	25	36	49	- - -	9801	10000
C	2	6	12	20	30	42	56	- - -	9900	10100

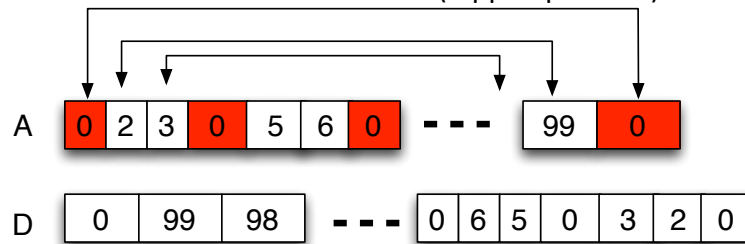
Answer Question 1

Task B: Managing lists

1. Starting from list A generated in Task A, set to zero the values in every third element.

A	1	2	3	4	5	6	7	- - -	99	0
A	0	2	3	0	5	6	0	- - -	99	0

- Then create a new list D that is the reverse (flipped position) of list A.



Answer Question 2

Task C: Maths and plotting functions

- Set a list x with integer values from 1 to 100 in steps of 5.
- Compute $y = \log_{10}(x)$.
- Plot y vs x.

Task D: Conditional flow

- 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'.
- 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'.

Answer Question 3

Task E: Finding Pi

- 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, N_c , 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 4

Task F: Prime numbers

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

Answer Question 5