

Foundational Mathematics for ML (MA2221)

Assignment – Python Loops and Iterative Logic (02-02-2026)

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Instructions:

- This assignment must be **solved during the lab session**.
- Students are expected to write and execute the code independently.
- Only **loops and basic control structures** may be used.
- Built-in shortcuts such as `sum`, `min`, `max`, `sorted` are **not allowed**.
- List/set comprehensions, dictionaries, and user-defined functions are **not permitted**.
- Problems are marked with difficulty levels: Easy (**[E]**), Moderate (**[M]**), Challenging (**[C]**).

1. **[E]** Using a `for` loop, print all integers between 1 and 100 that are divisible by 4 but not divisible by 8.

2. **[E]** Using a loop, compute the sum

$$1^2 + 2^2 + 3^2 + \dots + 50^2.$$

3. **[M]** Using a loop, compute the product of all odd integers between 1 and 15.

4. **[M]** Using nested loops, print the following pattern:

```
1
12
123
1234
12345
```

5. **[M]** Using loops only, print:

```
*
**
***
****
*****
```

6. **[M]** Using nested loops, print:

```
1
22
333
4444
55555
```

7. [M] Using a loop, generate the first 20 Fibonacci numbers and store them in a list.
8. [M] Using loops:
 - (a) Create a list of integers from 1 to 30.
 - (b) Create a new list containing numbers divisible by 3.
 - (c) Create another list containing numbers divisible by 5.
9. [M] Given the list

$$[2, 4, 6, 8, 10],$$

use nested loops to construct the multiplication table

$$\begin{bmatrix} 2 & 4 & 6 & 8 & 10 \\ 4 & 8 & 12 & 16 & 20 \\ 6 & 12 & 18 & 24 & 30 \\ 8 & 16 & 24 & 32 & 40 \\ 10 & 20 & 30 & 40 & 50 \end{bmatrix}.$$

10. [M] Using nested loops, compute the sum of each row of the multiplication table and store the result in a list.
11. [M] Using a `while` loop, find the smallest integer n such that

$$1 + 2 + 3 + \cdots + n > 1000.$$

12. [M] Given a positive integer N , use a `while` loop to determine how many times N can be divided by 2 before it becomes less than 1.
13. [M] Given the list

$$[1, 2, 2, 3, 3, 3, 4, 4, 4, 4],$$

use loops to:

- (a) Convert the list into a set.
- (b) Count the number of distinct elements.

14. [C] Given two lists

$$A = [1, 2, 3, 4, 5], \quad B = [4, 5, 6, 7],$$

use nested loops (not set intersection) to find the elements common to both lists.

15. [C] Given the list

$$[9, 3, 7, 1, 8, 2, 5],$$

sort the list in ascending order using only loops and swapping of elements.

End of Assignment