

## 1 Introduction to Loops

In Python, **loops** are used to **repeat a block of code multiple times**.

They help perform tasks like printing a message several times, iterating over lists, or generating patterns.

### Example:

```
print("Hello Saumya!")
print("Hello Saumya!")
print("Hello Saumya!")
print("Hello Saumya!")
```

Instead of writing this three times, we can use a **loop**.

## 2 while Loop

A **while** loop runs **as long as a condition is True**.

### Syntax:

```
while condition:
    # code block
```

### Example:

```
i = 1
while i <= 5:
    print("Hello, Saumya Singh!")
    i += 1
```

### Output:

```
Hello, Saumya Singh!
```

## Practice Questions

1. Write a Python program to print numbers from 1 to 10 using a `while` loop.
2. Write a program to print numbers from 10 down to 1 using a `while` loop.  
*(Hint: start from 10 and decrease the counter each time.)*

**Example Output:** 10 9 8 ... 1

3. Write a program to print all even numbers between 1 and 50 using a while loop.  
*(Hint: Use the modulus operator % to check for even numbers.)*

Example Output: 2 4 6 8 ... 50

4. Write a program that prints the sum of first n natural numbers.  
For example, if n = 5, then output should be  $1 + 2 + 3 + 4 + 5 = 15$ .  
*(Hint: Keep a running total inside the loop.)*
5. Write a program to print this pattern using a while loop:

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

*(Hint: use one while loop and string multiplication like '\*' \* count)*

6. Saumya wants to print her name 5 times, but each time with a number in front of it. Write a program using a while loop that prints:

1. Saumya Singh
2. Saumya Singh
3. Saumya Singh
4. Saumya Singh
5. Saumya Singh

7. Write a program to print the multiplication table of any number using a while loop.

(Hint: Start  $i = 1$  and run the loop until  $i \leq 10$ .)

Example Output:

Enter a number: 3

$3 \times 1 = 3$

$3 \times 2 = 6$

...

$3 \times 10 = 30$

## 3 for Loop

A **for** loop is used to **iterate (go through)** sequences like lists, tuples, or strings.

**Syntax:**

```
for element in sequence:  
    # code block
```

**Example:**

```
foods = ["Pizza", "Samosa", "GulabJamun"]  
for item in foods:  
    print("Saumya likes", item)
```

**Output:**

```
Saumya likes Pizza  
Saumya likes Samosa  
Saumya likes GulabJamun
```

### for Loop with range()

The **range()** function generates a sequence of numbers.  
It is often used with loops.

**Syntax:**

`range(start, stop, step)`

- `start` → beginning number (default = 0)
- `stop` → end limit (excluded)
- `step` → increment value (default = 1)

**Example:**

```
for i in range(1, 6):
    print("Iteration:", i)
```

**Output:**

```
Iteration: 1
Iteration: 2
Iteration: 3
Iteration: 4
Iteration: 5
```

**Practice Questions**

8. Write a program using `for` and `range()` to print all even numbers between 1 and 20.
9. Write a program to print numbers from 1 to 50, but print "Saumya Singh" instead of numbers that are multiples of 5.  
Example Output: 1 2 3 4 Saumya Singh 6 7 8 9 Saumya Singh ...
10. Write a program to print the square of each number from 1 to 10 using a for loop.  
Example Output: 1 4 9 16 25 36 49 64 81 100
11. Write a program that prints the multiplication table of any number entered by the user using a for loop.  
Example Output:

```
Enter number: 6
6 x 1 = 6
6 x 2 = 12
...
6 x 10 = 60
```

12. Write a program that prints all numbers from 100 to 1 using for and range().

Hint:

Use a negative step: range(100, 0, -1)

13. Saumya wants to print her username five times in uppercase letters.  
Write a program to print:

```
SAUMYA1SINGH
SAUMYA1SINGH
SAUMYA1SINGH
SAUMYA1SINGH
SAUMYA1SINGH
```

Hint:

Use a simple for loop and .upper() method.

14. You are given a list of Saumya's favorite foods. Write a Python program to print each food item using a for loop.

15. Saumya has created a tuple of countries she has already traveled to. Write a Python program to print each country using a for loop.

```
countries_traveled = ("Malaysia", "Vietnam", "Switzerland", "Italy", "Bhutan")
```

## ④ break, continue, and pass

### **break Statement**

The **break** statement **stops** the loop immediately when it is encountered.

#### **Example:**

```
for num in range(1, 10):
    if num == 5:
        break
    print(num)
```

### Output:

```
1
2
3
4
```

(Loop stops when num == 5)

### continue Statement

The `continue` statement **skips** the current iteration and moves to the next one.

### Example:

```
for num in range(1, 6):
    if num == 3:
        continue
    print(num)
```

### Output:

```
1
2
4
5
```

(3 is skipped)

### pass Statement

The `pass` statement **does nothing** — it's used as a placeholder when you want to keep a block empty.

### Example:

```
for i in range(5):
    pass # future code will go here
```

## Practice Questions

Write a program that prints numbers 1 to 10, but skips the number 7 using the `continue` statement.

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## 5 Nested Loops

A **loop inside another loop** is called a nested loop.

### Example:

```
for i in range(1, 4):
    for j in range(1, 4):
        print(i, j)
```

### Output:

```
1 1
1 2
1 3
2 1
2 2
2 3
3 1
3 2
3 3
```

## Practice Question 4

Write a program using nested loops to print this pattern:

```
*
```

  

```
* *
```

  

```
* * *
```

## Mini Project – Countdown Timer (with 1-second gap)

### Goal:

Print a countdown before something “exciting” happens (like “Launching...” or “Happy New Year!”).

**Concepts Used:** for loop, range(), and the time module.

## Mini Project – Multiplication Table

**Goal:** Print the multiplication table of a number using a loop.

### Sample Run:

Enter a number: 5

$5 \times 1 = 5$

$5 \times 2 = 10$

...

$5 \times 10 = 50$

## Mini Project – Guess the Number Game

**Concepts Used:** while loop and user input.

### Sample Run:

Guess a number between 1 and 10: 4

Wrong guess! Try again.

Guess again: 7

Congratulations, Saumya! You guessed it right 

## Summary

| Concept | Description | Example |
|---------|-------------|---------|
|---------|-------------|---------|

|                   |                                 |                                  |
|-------------------|---------------------------------|----------------------------------|
| <b>while loop</b> | Repeats while condition is true | <code>while i &lt;= 5:</code>    |
| <b>for loop</b>   | Iterates over sequence          | <code>for item in list:</code>   |
| <b>range()</b>    | Generates number sequence       | <code>range(1, 6)</code>         |
| <b>break</b>      | Exits the loop                  | <code>if x == 5: break</code>    |
| <b>continue</b>   | Skips one iteration             | <code>if x == 3: continue</code> |
| <b>pass</b>       | Placeholder (does nothing)      | <code>pass</code>                |

## Practice Set (Quick Recap)

1. Print numbers from 1 to 100 using a `for` loop.
2. Print numbers from 100 to 1 using a `while` loop.
3. Print all numbers between 1 and 50 except multiples of 5.
4. Create a program that asks the user for 5 favorite foods and prints them one by one.
5. Print the sum of first 10 natural numbers using a `while` loop.