**🎯 Topic: Lambda Functions, Map, Filter, Reduce in Python**

## **✅ 1. What is a Lambda Function?**

A **lambda** function is a **small, anonymous function** — defined without a name using the lambda keyword.

### **📘 Syntax:**

lambda arguments: expression

### **✅ Example 1: Add two numbers**

add = lambda a, b: a + b

print(add(5, 3)) # Output: 8

### **✅ Example 2: Square of a number**

square = lambda x: x \* x

print(square(4)) # Output: 16

### **💡 Use Lambda when:**

* You want a quick one-line function
* You don’t want to reuse it many times

## **✅ 2. What is map()?**

map() applies a **function to each item** in an iterable (like a list) and returns a **new list**.

### **📘 Syntax:**

map(function, iterable)

### **✅ Example: Convert all strings to uppercase**

fruits = ["apple", "banana", "mango"]

result = list(map(lambda fruit: fruit.upper(), fruits))

print(result) # ['APPLE', 'BANANA', 'MANGO']

### **✅ Example: Square all numbers**

nums = [1, 2, 3, 4]

squares = list(map(lambda x: x \* x, nums))

print(squares) # [1, 4, 9, 16]

## **✅ 3. What is filter()?**

filter() selects items from a list that **meet a condition** (returns True).

### **📘 Syntax:**

filter(function, iterable)

### **✅ Example: Filter even numbers**

nums = [1, 2, 3, 4, 5, 6]

even = list(filter(lambda x: x % 2 == 0, nums))

print(even) # [2, 4, 6]

### **✅ Example: Filter names with length > 5**

names = ["Ram", "Nandini", "Gowtham", "Nila"]

long\_names = list(filter(lambda name: len(name) > 5, names))

print(long\_names) # ['Nandini', 'Gowtham']

## **✅ 4. What is reduce()?**

reduce() **reduces a list to a single value** by applying a function cumulatively (comes from functools module).

### **📘 Syntax:**

from functools import reduce

reduce(function, iterable)

### **✅ Example: Sum of all numbers**

from functools import reduce

nums = [1, 2, 3, 4]

total = reduce(lambda a, b: a + b, nums)

print(total) # Output: 10

### **✅ Example: Find the maximum value**

nums = [10, 5, 22, 7]

maximum = reduce(lambda a, b: a if a > b else b, nums)

print(maximum) # Output: 22

## **🧠 Summary Table**

| **Concept** | **Purpose** | **Function Signature** |
| --- | --- | --- |
| lambda | One-line anonymous function | lambda x: x \* 2 |
| map() | Transform each item in a list | map(function, iterable) |
| filter() | Keep only items that meet condition | filter(function, iterable) |
| reduce() | Reduce list to single value | reduce(function, iterable) |

## **🎯 Real-Life Example for Teaching:**

### **🛍️ Shopping Cart – Filter expensive items and sum them**

from functools import reduce

prices = [250, 900, 1200, 400, 1500]

# Step 1: Keep only items above ₹1000

expensive = list(filter(lambda x: x > 1000, prices))

# Step 2: Calculate total

total = reduce(lambda a, b: a + b, expensive)

print("Expensive items total:", total)

🖨 Output:

Expensive items total: 2700

## **🎁 BONUS: When to use what?**

| **Use When You Want To...** | **Use** |
| --- | --- |
| Create a short 1-line function | lambda |
| Apply a function to all items | map() |
| Select only matching items | filter() |
| Combine values into one | reduce() |

### **About the Author**

**Gowtham SB** is a **Data Engineering expert, educator,** **and content creator** with a passion for **big data technologies, as well as cloud and Gen AI** . With years of experience in the field, he has worked extensively with **cloud platforms, distributed systems, and data pipelines**, helping professionals and aspiring engineers master the art of data engineering.

Beyond his technical expertise, Gowtham is a **renowned mentor and speaker**, sharing his insights through engaging content on **YouTube and LinkedIn**. He has built one of the **largest Tamil Data Engineering communities**, guiding thousands of learners to excel in their careers.

Through his deep industry knowledge and hands-on approach, Gowtham continues to **bridge the gap between learning and real-world implementation**, empowering individuals to build **scalable, high-performance data solutions**.

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