**Batch: C4-1 Roll No.: 16010124216**

**Experiment / assignment / tutorial No. 5**

**Grade: AA / AB / BB / BC / CC / CD /DD**

**Signature of the Staff In-charge with date**

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| **TITLE:** Write a program to demonstrate lambda, map, and filter functions in Python  **AIM**: 1) Write a Python program that uses lambda with filter() to select even numbers and map() to square them, displaying the original, filtered, and squared lists.  2) Write a Python program that generates a list of Pythagorean triplets (a, b, c) from a given list of integers, using lambda, filter(), and map(). The program should filter out invalid triplets and display valid ones.  **OUTCOME:** Students will be able to  **CO1:** Formulate a problem statement and develop the logic (algorithm/flowchart) for its solution.  **CO3:** Use different Decision-Making statements and Functions in Python. |

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**Resource Needed: Python IDE**

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**Books/ Journals/ Websites referred:**

1. Reema Thareja, *Python Programming: Using Problem-Solving Approach*, Oxford University Press, First Edition 2017, India
2. Sheetal Taneja and Naveen Kumar, *Python Programming: A modular Approach*, Pearson India, Second Edition 2018, India
3. https://www.geeksforgeeks.org/python-strings/?ref=lbp

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**Theory:**

**Lambda function :**

* A lambda function is a small anonymous function.
* A lambda function can take any number of arguments but have only one expression.
* Syntax

lambda *arguments*: *expression*

**map() function** returns a map object(which is an iterator) of the results after applying the given function to each item of a given iterable (list, tuple, etc.)

***Syntax*** *: map(fun, iter)*

***Parameters:***

* ***fun:*** *It is a function to which a map passes each element of a given iterable.*
* ***iter:*** *It is iterable which is to be mapped.*

**The filter() function** returns an iterator where the items are filtered through a function to test whether the item is accepted.

Syntax:

filter(*function*, *iterable*)

|  |  |
| --- | --- |
| *function* | A Function to be run for each item in the iterable |
| *iterable* | The iterable to be filtered |

**Problem Definition:**

1.In the below table, the input variable, Python code, and output column is given. You have to complete a blank cell in every row.

|  |  |
| --- | --- |
| Python Code | Output |
| x = lambda a : a + 10 print(x(5)) | 15 |
| x = lambda a, b : a \* b print(x(5, 6)) | 30 |
| def myfunc(n):   return lambda a : a \* n  mydoubler = myfunc(2)  print(mydoubler(11)) | 22 |
| **def** addition(n):  **return** n + n  numbers = (1, 2, 3, 4)  result = map(addition, numbers)  print(list(result)) | [2, 4, 6, 8] |
| numbers = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]  evens = list(filter(lambda x: x % 2 == 0, numbers))  print(evens) | [2, 4, 6, 8, 10] |
| square = lambda x: x \*\* 2  result = square(4)  print(result) | 16 |
| chars = ['a', 'b', 'e', 'i', 'o', 'u', 'z']  vowels = list(filter(lambda x: x in 'aeiou', chars))  print(vowels) | ['a', 'e', 'i', 'o', 'u'] |

**2) Write a Python program that uses lambda with filter() to select even numbers and map() to square them, displaying the original, filtered, and squared lists.**

**3) Write a Python program that generates a list of Pythagorean triplets (a, b, c) from a given list of integers, using lambda, filter(), and map(). The program should filter out invalid triplets and display valid ones.**

**Implementation details:**

**Q1:**num\_list = [5, 12, 17, 18, 24, 32]

*def* evenfunc(*x*):

  if(x%2==0):

    return True

  else:

    return False

even\_num = filter(evenfunc, num\_list)

for x in even\_num:

  print(x)

**Q2:**

*def* is\_pythagorean\_triplet(*triplet*):

    a, b, c = sorted(triplet)

    return a\*\*2 + b\*\*2 == c\*\*2

*def* generate\_triplets(*nums*):

    triplets = map(*lambda* *triplet*: triplet, [(a, b, c) for a in nums for b in nums for c in nums if a < b < c])

    valid\_triplets = filter(*lambda* *triplet*: is\_pythagorean\_triplet(triplet), triplets)

    return *list*(valid\_triplets)

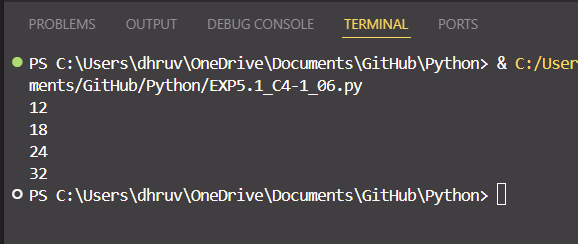
nums = [3, 4, 5, 6, 8, 10, 12, 15, 20]

pythagorean\_triplets = generate\_triplets(nums)

print("Valid Pythagorean Triplets:", pythagorean\_triplets)

**Output(s):**

**Q1:**



Q2 :  
A screen shot of a computer code

Description automatically generated

**Conclusion:**

Using lambda, map(), and filter() in Python helps us write cleaner and more efficient code. Lambda allows us to create small, anonymous functions quickly, while map lets us apply a function to every element in a list. Filter helps us pick out only the elements that meet a certain condition. Together, they make it easier for us to work with data, avoid long loops, and keep our code concise and readable.

**Post Lab Descriptive Questions**

1. **Explain the following built-in functions of python**

**1.abs() -** The abs() function in Python returns the absolute value of a number. It removes any negative sign, making the result non-negative. It works with integers, floats, and complex numbers

**2.max() -** The max() function in Python returns the largest item in an iterable list or the largest of two or more arguments.

**3.exec() -** The exec() function in Python dynamically executes Python code, which can be a string or a block of code. It allows you to run Python commands or even entire scripts within your program.

**4.range() -** The range() function in Python generates a sequence of numbers, typically used in loops. It takes up to three arguments: start, stop, and step. The range() function is commonly used in for loops to iterate over a series of numbers.

1. **Explain the difference between user-defined function and built-in function  
   Ans.**

The key difference between user-defined functions and built-in functions in Python is:

* **Built-in functions**: These are pre-defined functions provided by Python, and they are available for immediate use without needing to define them. Examples include print(), len(), max(), abs(), etc. They are part of Python's standard library and offer basic, commonly used functionality.
* **User-defined functions**: These are functions that programmers create to perform specific tasks in their code. They are defined using the def keyword, followed by a function name, parameters, and a block of code. For example: