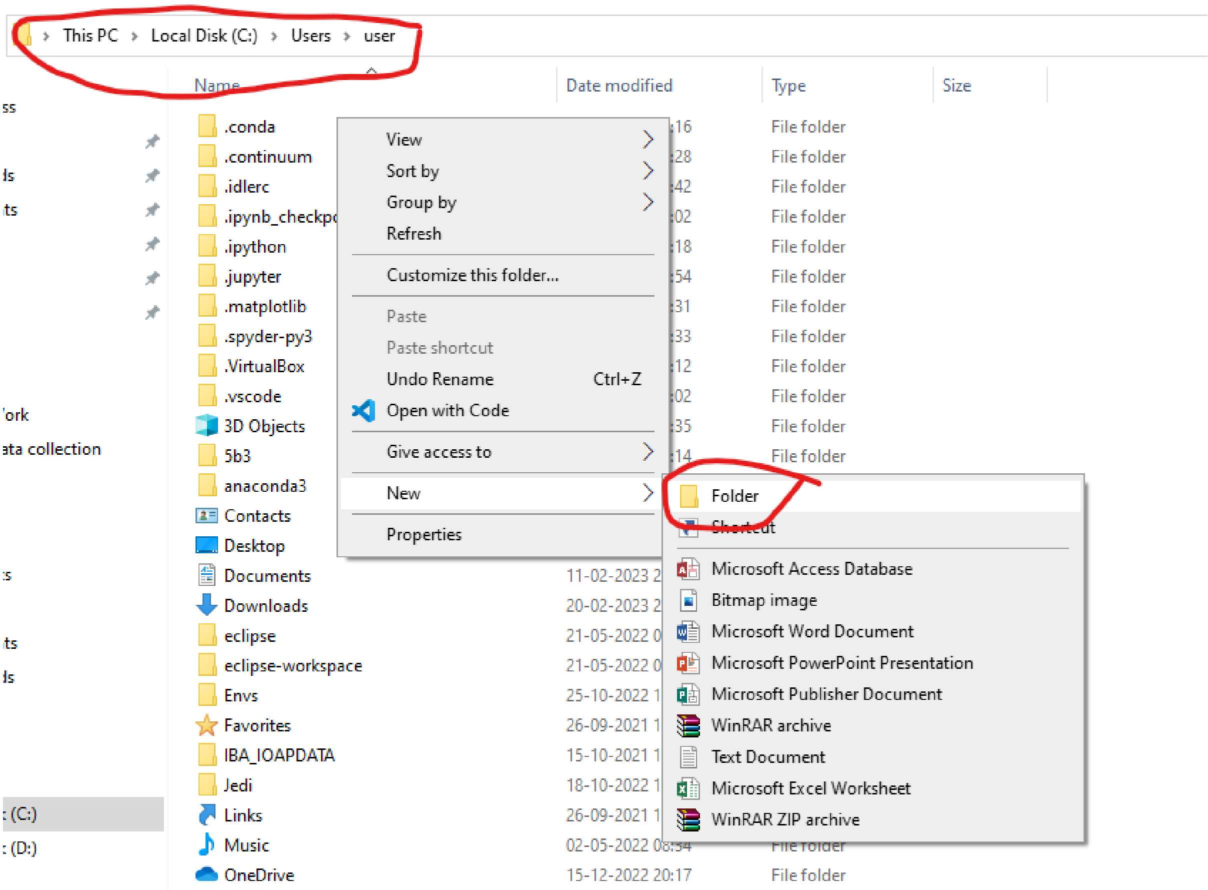
Creation of a Library

Step 1:

Create a folder in where you have to save your Library (Working Directory).

Name the folder as your Library name.



Here we named it as library.

Step 2:

Create __init__.py file in the folder to treat it as a Library/Package by the PVM.

Step 3:

Create a new folder for the package and name it

Here we named it as number – because we are working with number checks.

Step 4:

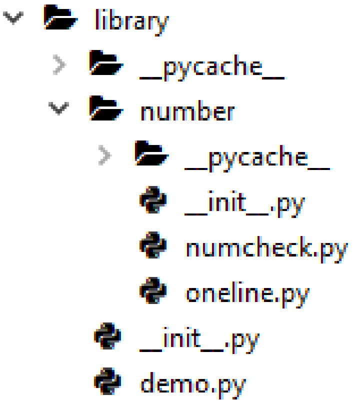
Create a __init__.py file in the *number* folder to it as a Package.

Note: Library and Package are same in nature and properties but in case of Package it is a collection of similar modules and Library is a collection of Packages.

Step 5:

Create modules (.py) files and save them in the in the *number* folder.

Here we created the modules called **numcheck** and **oneline**.



```
library
    __pycache__
    number
        __pycache__
        __init__.py
        numcheck.py
        oneline.py
    __init__.py
    demo.py
```

Here to show that even the Library can also work as a package we created a **demo** module inside the library folder.

Description about modules:

numcheck :

In the numcheck module we created the functions to check the number identities.

In this module directory of the module is

```
>>> import library.number.numcheck as numcheck
```

# We discuss about this in the comming explanation.

```
>>> dir(numcheck)
['__builtins__', '__cached__', '__doc__', '__file__', '__loader__', '__name__',
'__package__', '__spec__', 'fact', 'isArmstrong', 'isDisarium', 'isHappy',
'isHarshad', 'isNeon', 'isPerfect', 'isPrime', 'isSpy', 'isStrong', 'isSunny',
'n_Armstrongs', 'n_Perfect', 'n_Primes', 'nextArmstrong', 'nextPerfect',
'nextPrime']
```

In this directory __.....__ directory or functions are built-in functions that are automatically added by the PVM.

```
>>> help(numcheck)
Help on module library.number.numcheck in library.number:


NAME
    library.number.numcheck - Created on Thu Dec 22 22:42:14 2022
```

```
MODULE REFERENCE
    https://docs.python.org/3.10/library/library.number.numcheck.html

    The following documentation is automatically generated from the Python
    source files.  It may be incomplete, incorrect or include features that
    are considered implementation detail and may vary between Python
    implementations.  When in doubt, consult the module reference at the
    location listed above.

DESCRIPTION
    @author: 21091A05H9

FUNCTIONS
    fact(n: int) -> int
        Factorial : 1 * 2 * 3 * 4 * ...... * (n-1) * n
        Parameters
        ----------
        n : int
            To find the factorial(n)
        Returns
        -------
        int
            factorial of n

    isArmstrong(num: int) -> bool
        Armstrong : sum of individual digits with power of number of digits in
num
        Parameters
        ----------
        num : int
            To check Armstrong number or not.
        Returns
        -------
        bool
            True  <if n is Armstrong number>
            False <if n is not a Armstrong number>

    isDisarium(n: int) -> bool
        Disarium : A number is a Disarium number if the sum of the digits
powered with
        their respective positions is equal to the number itself.
        Parameters
        ----------
        n : int
            To check Disarium number or not.
        Returns
        -------
        bool
            True  <if n is Disarium number>
            False <if n is not a Disarium number>

    isHappy(n: int) -> bool
        Happy : if a number leads to 1 after a sequence of steps where in each
step
        number is replaced by sum of squares of its digit
        Parameters
        ----------
        n : int
            To check Happy number or not.
        Returns
        -------
        bool
        True  <if n is Happy number>
        False <if n is not a Happy number>

isHarshad(n: int) -> bool
    Harshad : if a number is divisible by the sum of its digits
    Parameters
    ----------
    n : int
        To check Hashad number or not.
    Returns
    -------
    bool
        True  <if n is Harshad number>
        False <if n is not a Harshad number>

isNeon(num: int) -> bool
    Neon : sum of individual digits of its square is equal to itself <num>
    Parameters
    ----------
    num : int
        To check Neon number or not.
    Returns
    -------
    bool
        True  <if n is Neon number>
        False <if n is not a Neon number>

isPerfect(num: int) -> bool
    Perfect number : sum of factors is equal to itself <num>
    Parameters
    ----------
    num : int
        To check Perfect number or not.
    Returns
    -------
    bool
        True  <if n is Perfect number>
        False <if n is not a Perfect number>

isPrime(num: int) -> bool
    Prime : A number is divisible by 1 and itself
    Parameters
    ----------
    num : int
        To check Prime number or not.
    Returns
    -------
    bool
        True  <if n is Prime number>
        False <if n is not a Prime number>

isSpy(n: int) -> bool
    Spy : Product of individual digits is equal to itself <n>
    Parameters
    ----------
    n : int
        To check Spy number or not.
    Returns
    -------
    bool
```

```
        True  <if n is Spy number>
        False <if n is not a Spy number>

isStrong(n: int) -> bool
    Strong : if the sum of factorial of individual digit is equal to itself <n>
    Parameters
    ----------
    n : int
        To check Strong number or not.
    Returns
    -------
    bool
        True  <if n is Strong number>
        False <if n is not a Strong number>

isSunny(n: int) -> bool
    Sunny : if 1 added to the given number, then the square root of it becomes a whole number
    Parameters
    ----------
    n : int
        To check Sunny number or not.
    Returns
    -------
    bool
        True  <if n is Sunny number>
        False <if n is not a Sunny number>

n_Armstrongs(n: int) -> list
    Armstrong : sum of individual digits with power of number of digits in num
```

```
        Parameters

        ----------

        n : int

        Returns

        -------

        list[l]

            Returns list of 'n' Armstrong numbers from 1.


    n_Perfect(n: int) -> list

        Perfect number : sum of factors is equal to itself <num>

        Parameters

        ----------

        n : int

        Returns

        -------

        list[l]

            Returns List of 'n' Perfect numbers


    n_Primes(n: int) -> list

        Prime : A number is divisible by 1 and itself

        Parameters

        ----------

        n : int

        Returns

        -------

        list[l]

            Returns list of 'n' Prime numbers from 2.


    nextArmstrong(num: int) -> int

        Armstrong : sum of individual digits with power of number of digits in
num
```

```
        Parameters
        ----------
        num : int
        Returns
        -------
        x : int
            x is the first next Prime number after the n.

    nextPerfect(num: int) -> int
        Perfect number : sum of factors is equal to itself <num>
        Parameters
        ----------
        num : TYPE <int>

        Returns
        -------
        x : int
             x is the first next Perfect number after the n.

    nextPrime(num: int) -> int
        Prime : A number is divisible by 1 and itself
        Parameters
        ----------
        num : int
        Returns
        -------
        x : int
            x is the first next Prime number after the n

FILE
```

c:\users\user\appdata\local\programs\python\python310\lib\library\number\numcheck.py

— *Destination of the library was not as we discussed in the staring, because we created in the Directory*

C:\Users\user\AppData\Local\Programs\Python\Python310\Lib

To consider it as a library from any directory in the Python IDLE.

Code in the numcheck module

```
# -*- coding: utf-8 -*-
"""
Created on Thu Dec 22 22:42:14 2022

@author: 21091A05H9
"""


def isPrime(num: int) -> bool:
    '''
    Prime : A number is divisible by 1 and itself
    Parameters
    ----------
    num : int
        To check Prime number or not.
    Returns
    -------
    bool
        True  <if n is Prime number>
        False <if n is not a Prime number>
    '''
    for i in range(2,num//2+1):
        if num%i == 0:
            return False
    return True
def nextPrime(num: int) -> int:
    '''
    Prime : A number is divisible by 1 and itself
    Parameters
    ----------
    num : int
    Returns
    -------
    x : int
        x is the first next Prime number after the n
    '''
    x=num+1
    while True:
        if isPrime(x):
            return x
        x += 1
def n_Primes(n: int) -> list:
    '''
    Prime : A number is divisible by 1 and itself
    Parameters
    ----------
    n : int
    Returns
    -------
    list[l]
        Returns list of 'n' Prime numbers from 2.
    '''
    x=2
    li = []
    for i in range(n):
        x=nextPrime(x)
        li.append(x)
    return li
def isArmstrong(num: int) -> bool:
    '''
    Armstrong : sum of individual digits with power of number of digits in num
    Parameters
    ----------
    num : int
        To check Armstrong number or not.
    Returns
    -------
    bool
        True  <if n is Armstrong number>
        False <if n is not a Armstrong number>
    '''
    snum = str(num)
    li = [int(i) ** len(snum) for i in snum]
    return sum(li) == num
def nextArmstrong(num: int) -> int:
    '''
    Armstrong : sum of individual digits with power of number of digits in num
    Parameters
    ----------
    num : int
    Returns
    -------
    x : int
```

```
        x is the first next Prime number after the n.
    '''
    x=num+1
    while True:
        if isArmstrong(x):
            return x
        x += 1
def n_Armstrongs(n: int) -> list:
    '''
    Armstrong : sum of individual digits with power of number of digits in num
    Parameters
    ----------
    n : int
    Returns
    -------
    list[l]
        Returns list of 'n' Armstrong numbers from 1.
    '''
    x=1
    li = []
    for i in range(n):
        x=nextArmstrong(x)
        li.append(x)
    return li
def isPerfect(num: int) -> bool:
    '''
    Perfect number : sum of factors is equal to itself <num>
    Parameters
    ----------
    num : int
```

```
        To check Perfect number or not.
    Returns
    -------
    bool
        True  <if n is Perfect number>
        False <if n is not a Perfect number>
    '''
    sum = 0
    for i in range(1,num//2+1):
        if num % i == 0:
            sum += i
    return sum == num
def nextPerfect(num: int) -> int:
    '''
    Perfect number : sum of factors is equal to itself <num>
    Parameters
    ----------
    num : TYPE <int>

    Returns
    -------
    x : int
         x is the first next Perfect number after the n.
    '''
    x=num+1
    while True:
        if isPerfect(x):
            return x
        x += 1
def n_Perfect(n: int) -> list:
    '''
    Perfect number : sum of factors is equal to itself <num>
    Parameters
    ----------
    n : int
    Returns
    -------
    list[l]
        Returns List of 'n' Perfect numbers
    '''
    x=1
    li = []
    for i in range(n):
        x=nextPerfect(x)
        li.append(x)
    return li
def fact(n: int) -> int:
    '''
    Factorial : 1 * 2 * 3 * 4 * ...... * (n-1) * n
    Parameters
    ----------
    n : int
        To find the factorial(n)
    Returns
    -------
    int
        factorial of n
    '''
    if n<=1:
        return 1
    return n*fact(n-1)
def isNeon(num: int) -> bool:
    '''
    Neon : sum of individual digits of its square is equal to itself <num>
    Parameters
    ----------
    num : int
        To check Neon number or not.
    Returns
    -------
    bool
        True  <if n is Neon number>
        False <if n is not a Neon number>
    '''
    sq=num*num
    li = [int(i) for i in str(sq)]
    return sum(li) == num
def isSpy(n: int) -> bool:
    '''
    Spy : Product of individual digits is equal to itself <n>
    Parameters
    ----------
    n : int
        To check Spy number or not.
    Returns
    -------
    bool
        True  <if n is Spy number>
        False <if n is not a Spy number>
    '''
    li=[int(i) for i in str(n)]
    pro=1
    for i in li:
        pro *= i
    return sum(li) == pro
def isHappy(n: int) -> bool:
    '''
    Happy : if a number leads to 1 after a sequence of steps where in each step
    number is replaced by sum of squares of its digit
    Parameters
    ----------
    n : int
        To check Happy number or not.
    Returns
    -------
    bool
        True  <if n is Happy number>
        False <if n is not a Happy number>
    '''
    while n >9:
        li = [int(i) ** 2 for i in str(n)]
        n = sum(li)
        if n==1 or n == 7:
            return True
    return False
def isSunny(n: int) -> bool:
    '''
    Sunny : if 1 added to the given number, then the square root of it becomes
a whole number
    Parameters
    ----------
    n : int
        To check Sunny number or not.
    Returns
    -------
    bool
        True  <if n is Sunny number>
        False <if n is not a Sunny number>
    '''
    from math import sqrt
    x = sqrt(n+1)
    return x==int(x)
def isDisarium(n: int) -> bool:
    '''
    Disarium : A number is a Disarium number if the sum of the digits
powered with
    their respective positions is equal to the number itself.
    Parameters
    ----------
    n : int
        To check Disarium number or not.
    Returns
    -------
    bool
        True  <if n is Disarium number>
        False <if n is not a Disarium number>
    '''
    i=1
    Sum=0
    for j in str(n):
        Sum += int(j)**i
        i += 1
    return Sum == n
def isHarshad(n: int) -> bool:
    '''
    Harshad : if a number is divisible by the sum of its digits
    Parameters
    ----------
    n : int
        To check Hashad number or not.
    Returns
    -------
    bool
        True  <if n is Harshad number>
        False <if n is not a Harshad number>
    '''
    a=str(n)
    l = [int(i) for i in a]
    return n % sum(l) == 0
def isStrong(n: int) -> bool:
    '''
    Strong : if the sum of factorial of individual digit is equal to itself <n>
    Parameters
    ----------
    n : int
        To check Strong number or not.
    Returns
    -------
    bool
        True  <if n is Strong number>
        False <if n is not a Strong number>
    '''
    a = str(n)
    l = [fact(int(i)) for i in a]
    return sum(l) == n
```

oneline:

In this module we created the lambda functions

```
>>> import library.number.oneline as oneline
>>> dir(oneline)
['__builtins__', '__cached__', '__doc__', '__file__', '__loader__', '__name__',
'__package__', '__spec__', 'isAnagram', 'isAutomorphic', 'isTrimorphic']
>>> help(oneline)
Help on module library.number.oneline in library.number:

NAME
    library.number.oneline - Created on Mon Feb 20 08:26:01 2023

MODULE REFERENCE
    https://docs.python.org/3.10/library/library.number.oneline.html

    The following documentation is automatically generated from the Python
    source files.  It may be incomplete, incorrect or include features that
    are considered implementation detail and may vary between Python
    implementations.  When in doubt, consult the module reference at the
    location listed above.

DESCRIPTION
    @author: 21091A05H9

    Automorphic : A number whose square ends in the same digits as in the
number itself
```

Trimorphic : A number whose cube ends in the same digits as in the number itself

Anagram : letters of one string can be rearranged to form the other string

FUNCTIONS

isAnagram lambda n1, n2

isAutomorphic lambda n

isTrimorphic lambda n

FILE

c:\users\user\appdata\local\programs\python\python310\lib\library\number\oneline.py

Code in oneline

```
# -*- coding: utf-8 -*-
"""
Created on Mon Feb 20 08:26:01 2023


@author: 21091A05H9


Automorphic : A number whose square ends in the same digits as in the number itself



Trimorphic : A number whose cube ends in the same digits as in the number itself
```

```
Anagram : letters of one string can be rearranged to form the other string
"""


isAutomorphic = lambda n:str(n*n).endswith(str(n))
isTrimorphic = lambda n:str(n**3).endswith(str(n))
isAnagram = lambda n1,n2:set(n1) == set(n2)
```

Let us discuss one more module in the library folder that is **demo**

```
>>> import library.demo as demo
>>> dir(demo)
['__builtins__', '__cached__', '__doc__', '__file__', '__loader__', '__name__',
'__package__', '__spec__', 'hi']
>>> help(demo)
Help on module library.demo in library:

NAME
    library.demo - Created on Sun Feb 19 14:35:49 2023

MODULE REFERENCE
    https://docs.python.org/3.10/library/library.demo.html

    The following documentation is automatically generated from the Python
    source files.  It may be incomplete, incorrect or include features that
    are considered implementation detail and may vary between Python
    implementations.  When in doubt, consult the module reference at the
    location listed above.

DESCRIPTION
    @author: 21091A05H9

FUNCTIONS
```

```
    hi()


FILE

c:\users\user\appdata\local\programs\python\python310\lib\library\demo.py
```

Code in demo

```
# -*- coding: utf-8 -*-
"""
Created on Sun Feb 19 14:35:49 2023


@author: 21091A05H9
"""


def hi():
    print("Hello")
```

Conclusions on Library, Package and Modules

- Module is a collection of Functions, Classes, and Variables for constant values.
- Package is a collection of Modules.
- Library is a collection of Packages.
- Library and Package both are having equal properties but different behavior and priority.
- If we create and Library, Package and Module in current working directory then we can use them in our directory only.
- If we want to use any Library, Package and Module in any directory in Python IDLE then we want to save it in
  C:\Users\user\AppData\Local\Programs\Python\Python310\Lib
  OR
  C:\Users\user\AppData\Local\Programs\Python\Python310\Lib\site-packages
- The above Directory may change from Environment to Environment for Python Interpreter.