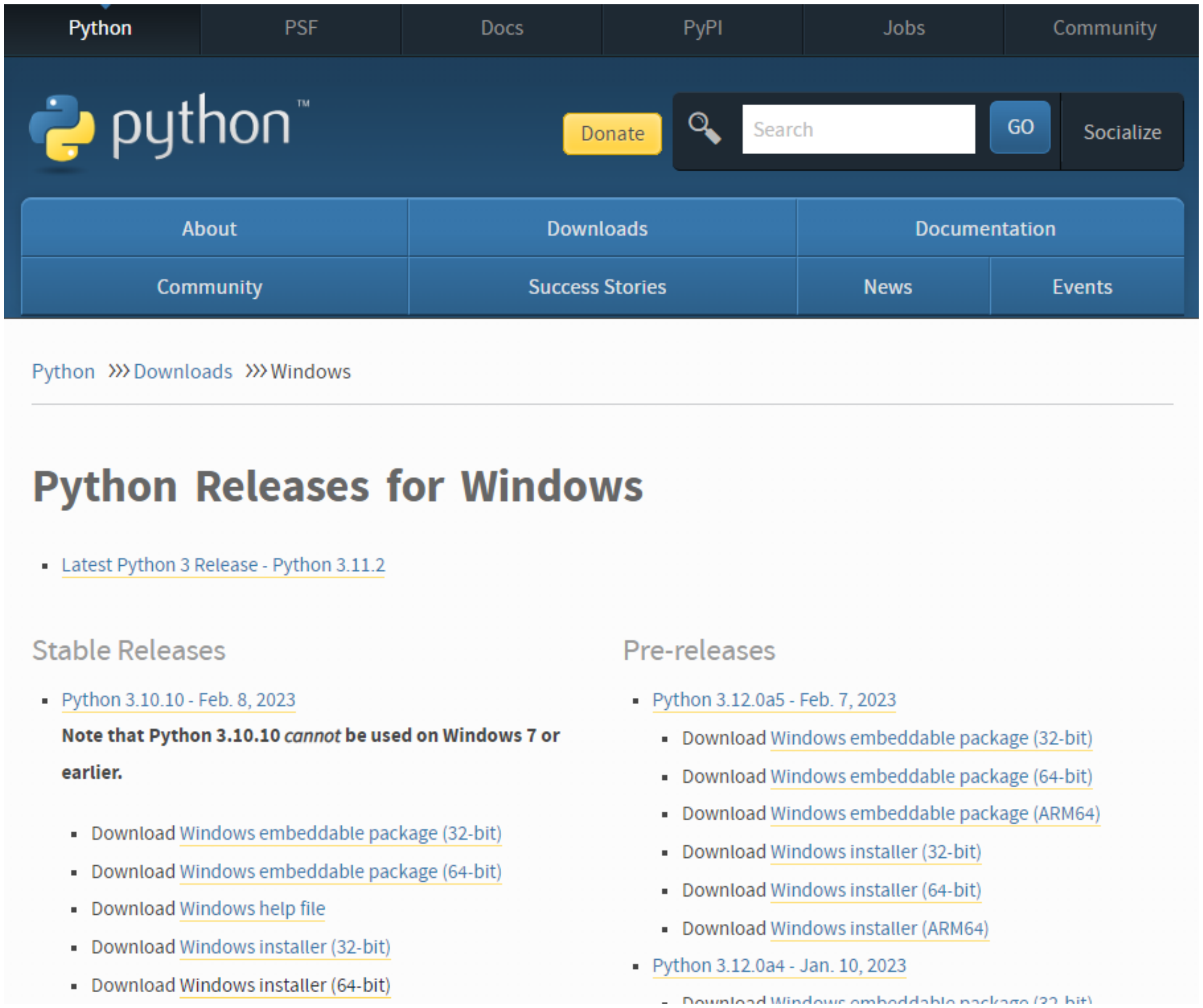
Week -1: Basics

1)Python Installation:

Windows:

1. Download Python: Go to the official python website at https://www.python.org/downloads/ and click on the "Download Python" button. Choose the latest version for windows.



Python >>> Downloads >>> Windows

Python Releases for Windows

- Latest Python 3 Release - Python 3.11.2

Stable Releases

- Python 3.10.10 - Feb. 8, 2023

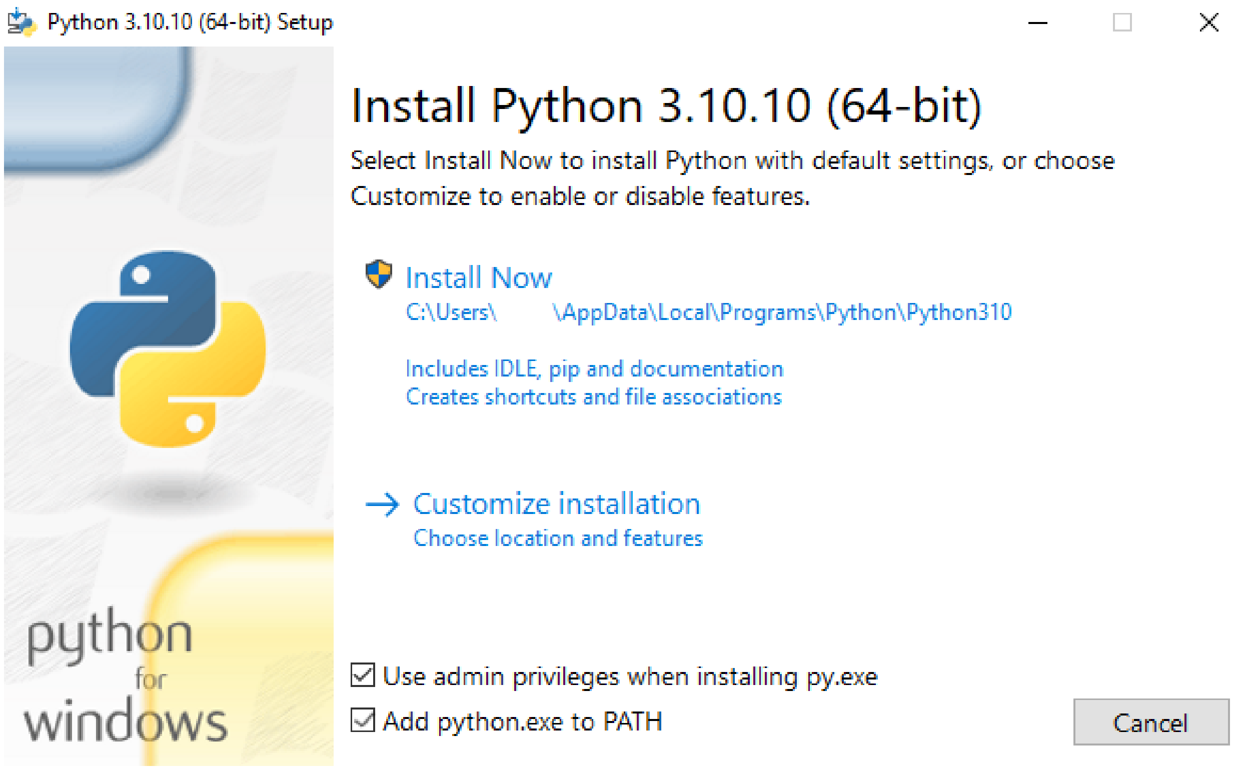
  Note that Python 3.10.10 *cannot* be used on Windows 7 or earlier.

  - Download Windows embeddable package (32-bit)
  - Download Windows embeddable package (64-bit)
  - Download Windows help file
  - Download Windows installer (32-bit)
  - Download Windows installer (64-bit)

Pre-releases

- Python 3.12.0a5 - Feb. 7, 2023
  - Download Windows embeddable package (32-bit)
  - Download Windows embeddable package (64-bit)
  - Download Windows embeddable package (ARM64)
  - Download Windows installer (32-bit)
  - Download Windows installer (64-bit)
  - Download Windows installer (ARM64)
- Python 3.12.0a4 - Jan. 10, 2023

2. Run Installer: Locate the downloaded installer file (usually named something like python-3.10.10.exe) and double-click it to run the installer.



Python 3.10.10 (64-bit) Setup

Install Python 3.10.10 (64-bit)

Select Install Now to install Python with default settings, or choose Customize to enable or disable features.

Install Now
C:\Users\ \AppData\Local\Programs\Python\Python310

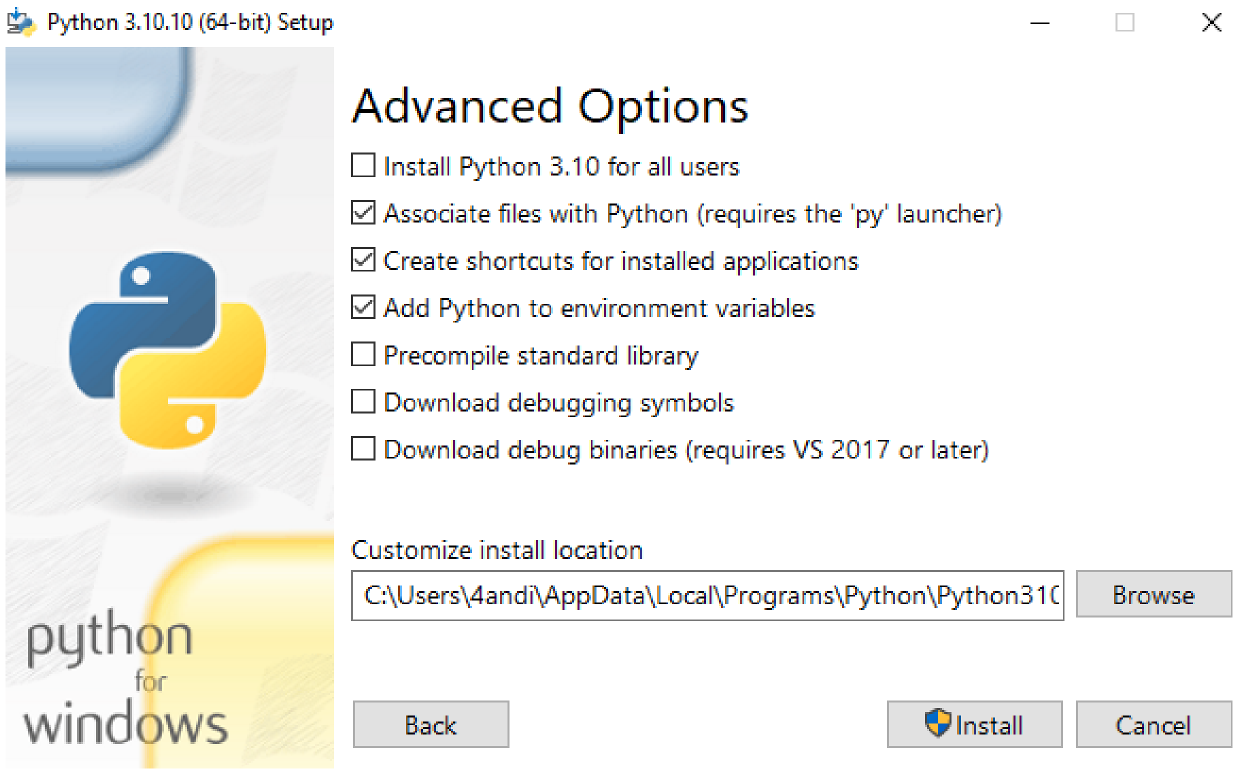
Includes IDLE, pip and documentation
Creates shortcuts and file associations

Customize installation
Choose location and features

☑ Use admin privileges when installing py.exe
☑ Add python.exe to PATH

3. Customize Installer (Optional): On the first screen of the installer, make sure to check the box that says "Add Python 3.x to PATH." This will make it easier to run Python from the Command Prompt. You can also customize the

installation directory if needed.



Python 3.10.10 (64-bit) Setup

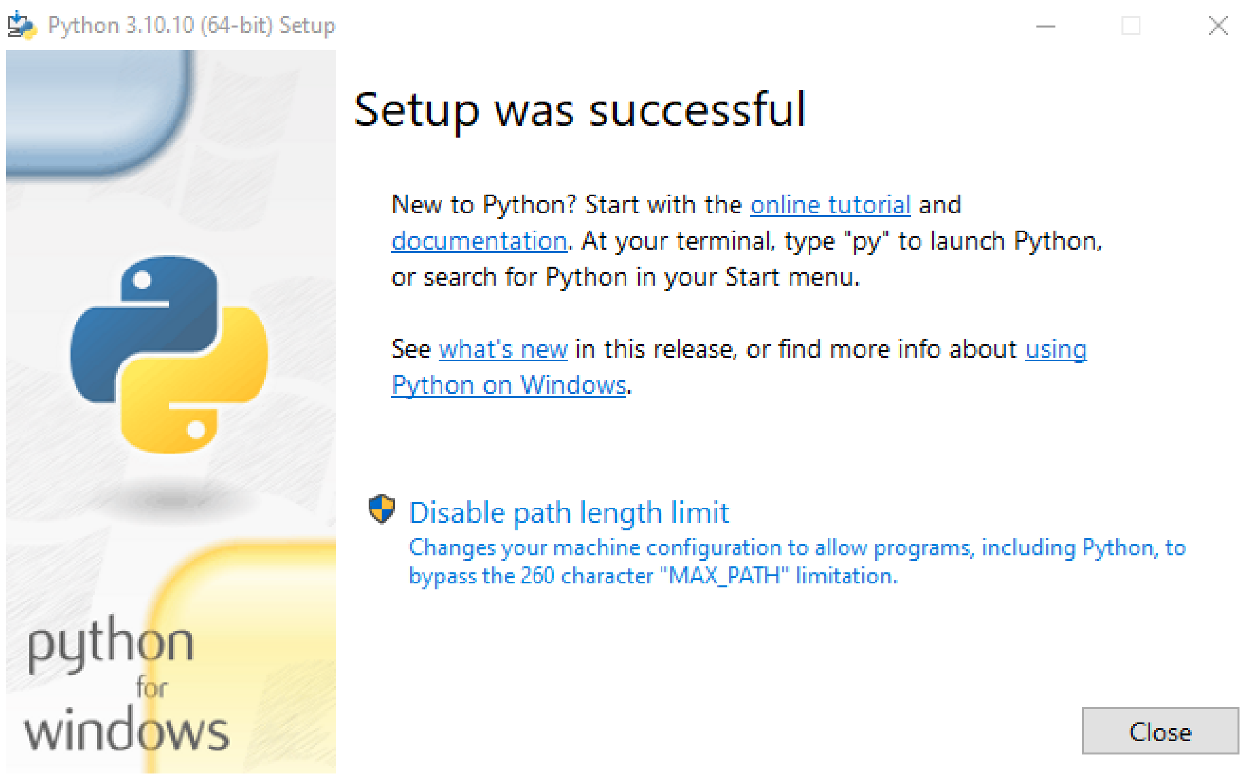
Advanced Options

- [ ] Install Python 3.10 for all users
- [✓] Associate files with Python (requires the 'py' launcher)
- [✓] Create shortcuts for installed applications
- [✓] Add Python to environment variables
- [ ] Precompile standard library
- [ ] Download debugging symbols
- [ ] Download debug binaries (requires VS 2017 or later)

Customize install location

C:\Users\4andi\AppData\Local\Programs\Python\Python310

4. Install Python: Click the “Install now” button to start the installation process. The installer will copy the necessary files to your system.
5. Installation complete: Once the installation is complete, you’ll see a screen that says “Setup was successful.” You can now close the installer.


Python 3.10.10 (64-bit) Setup

Setup was successful

New to Python? Start with the online tutorial and documentation. At your terminal, type "py" to launch Python, or search for Python in your Start menu.

See what's new in this release, or find more info about using Python on Windows.

Disable path length limit

Changes your machine configuration to allow programs, including Python, to bypass the 260 character "MAX_PATH" limitation.

2. Start a Python interpreter and use it as a Calculator.

```
#Calculator
a=int(input("enter a number"))
b=int(input("enter a number"))
print("add:",a+b)
print("sub:",a-b)
print("multiplication:",a*b)
print("division:",a/b)
```

Output:

```
enter a number 4
enter a number 5
```

```
add: 9

sub: -1

multiplication: 20

division: 0.8
```

3. Write a program to purposefully raise Indentation Error and correct it.

```
#Indentation Error

a=5

    b=2

print("add:",a+b)

#correct program

a=5

b=2

Print(“add:”,a+b)
```

Output:

```
7
```

**4. i) Write a program to calculate compound interest when principal, rate and number
of periods are given.**

Program:

```
#compound interest

#p=principle,r=rate,t=time period,CI=compound interest,A=amount after time
period

p=1000

r=2
```

```
t=3
A=p*((1+r/100)**t)
CI=A-p
print("amount after time period",A)
print("compound intrest:",CI)
```

output:

```
amount after time period 1061.208
compound intrest: 61.20800000000084
```

ii) Given coordinates (x1, y1), (x2, y2) find the distance between two points

Program:

```
x1=int(input("enter the x1 value"))
x2=int(input("enter the x2 value"))
y1=int(input("enter the y1 value"))
y2=int(input("enter the y2 value"))
d=((x1-x2)**2+(y1-y2)**2)**(1/2)
print("distance between two given points is ",d)
```

output:

```
enter the x1 value0
enter the x2 value2
enter the y1 value0
enter the y2 value2
distance between two given points is  2.8284271247461903
```

5. Read name, address, email and phone number of a person through keyboard and
print the details.

Program:

```
name=input("enter your name  ")

email_id=input("enter your email-id  :")

phone_no=int(input("enter your phone number  :"))

address=input("enter your address :")

print("Name:",name)

print("Email-id:",email_id)

print("Phone-no:",phone_no)

print("Address:",address)
```

output:

```
enter your name :Divya

enter your email-id :divya@gmail.com

enter your phone number :987654321

enter your address: Hyderabad,Telangana

Name: Divya

Email-id: divya@gmail.com

Phone-no: 987654321

Address: Hyderabad,Telangana
```

Week - 2: Operations

1. Print the below triangle using for loop.
5
4 4
3 3 3
2 2 2 2
1 1 1 1 1

Program:

```
num=5

for i in range(0,5):

    for j in range(0,i+1):

        print(num,end=" ")

    print("\n")

    num=num-1
```

output:

```
5


4 4


3 3 3


2 2 2 2


1 1 1 1 1
```

2. Write a program to check whether the given input is digit or lowercase character
or uppercase character or a special character (use 'if-else-if' ladder)

Program:

```
a=input("enter any element")

if a.islower():

    print("given input is of lower case characters")

elif a.isupper():

    print("given input is of upper case characters")

elif a.isalnum():

    print("Given input are numbers")

else:

    print("special characters")
```

output:

```
enter any element%^

special characters
```

3. Python Program to Print the Fibonacci sequence using while loop

Program:

```
#fibonacci series

a=int(input("enter the number of elements in fibonacci series"))

l=0

i=0

j=1

k=i+j
```

```
for l in range(0,a):
    print(i)
    i=j
    j=k
    k=i+j
```

output:

```
enter the number of elements in fibonacci series 7
0
1
1
2
3
5
8
```

4. Python program to print all prime numbers in a given interval (use break)

Program:

```
count=0
a=int(input("enter the lowest  range"))
b=int(input("enter the upper range"))
for n in range(a,b):
    if(n>0):
        for j in range(1,n+1):
            if(n%j==0):
```

```
            count=count+1


        if(count==2):
            print(n," is a prime number")
        count=0
    else:
        break
        output:
enter the lowest  range1
enter the upper range30
2  is a prime number
3  is a prime number
5  is a prime number
7  is a prime number
11  is a prime number
13  is a prime number
17  is a prime number
19  is a prime number
23  is a prime number
     29 is a prime number
```

5.Write a program to compute LCM of two numbers by taking input from the user

Program:

```
import math as m
num1=int(input(“enter a number”))
num2=int(input(“enter another number”))
HCF=m.gcd(num1,num2)
LCM=int((num1*num2)/(HCF))
print(“LCM of given numbers :”,LCM)
```

output:

```
enter a number3
enter another number4
LCM of given numbers : 12
```

6.Write a program add.py that takes 2 numbers as command line arguments and prints its sum.

Program:

```
import sys as s
sum=float(s.argv[1])+float(s.argv[2])
print("sum is:",sum)
```

output:

```
C:\Users\abhil\OneDrive\Documents\cls.py>py add.py 1 2

Sum is 3
```

Week - 3: Lists & Tuples

1. **i) Write a program to convert a list and tuple into arrays.**

   Program:
```
from array import array
list=[1,2,3]
list_array=array("i",list)
print(“list_array:”,list_array)
tuple=(4,9,0)
tuple_array=array("i",tuple)
print(“tuple_array:”,tuple_array)
```
   output:
```
list_array: array(‘i’,[1,2,3])
tuple_array:array(‘i’,[2,9,0])
```

   ii) Write a program to find common values between two arrays.

   Program:
```
from array import *
array1=array('i',[7,8,9,8])
array2=array('i',[23,33,11,8])
common_values=[]
for i in array1:
    for j in array2:
        if i==j:
            common_values.append(i)
common_values=set(common_values)
print(common_values)
```
   output:
```
 8
```

2. Write a function called gcd that takes parameters a and b and returns their greatest common divisor.

Program:
```
def gcd(a, b):
    while b:
        a, b = b, a % b
    return a
num1 = 48
num2 = 18
result = gcd(num1, num2)
print("GCD of", num1, "and", num2, "is:", result)
```

output:

```
GCD of 48 and 18 is: 6
```

3. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.

Program:

```
def palindrome(string):

    len_string=len(string)
    for i in range(0,int(len_string/2)):
        if(string[i]==string[len_string-1]):
            len_string=len_string-1
            return True
        else:
            return False
a=input("enter a string ")
c=palindrome(a)
print(c)
```

output:

```
enter a string madam
True
```

4. Find mean, median, mode for the given set of numbers in a list.

Program:

```
import statistics as s
list=[]
n=int(input("enter the number of elements"))
for i in range(0,n):
    print("enter the element")
    elements=int(input())
    list.append(elements)
print(s.mean(list),"=mean")
print(s.mode(list),"=mode")
print(s.median(list),"=median")
```

output:

```
enter the number of elements5
enter the element
3
enter the element
5
enter the element
3
enter the element
6
enter the element
2
3.8 =mean
3 =mode
3 =median
```

5. Write a Python program to create a tuple.

Program:

```
tuple1 = (1, 2, 3, 4, 5)
# Creating an empty tuple
tuple2 = ()
# Creating a tuple with a single element
tuple3 = (10,)  # Note the comma after the single element
tuple4 = tuple([6, 7, 8, 9, 10])
tuple5 = ("apple", 3.14, True)

print("Tuple 1:", tuple1)
print("Tuple 2:", tuple2)
print("Tuple 3:", tuple3)
print("Tuple 4:", tuple4)
print("Tuple 5:", tuple5)
```
output:
```
Tuple 1: (1, 2, 3, 4, 5)
Tuple 2: ()
Tuple 3: (10,)
Tuple 4: (6, 7, 8, 9, 10)
Tuple 5: ('apple', 3.14, True)
```

6.Write a Python program to create a tuple with different data types.

Program:
```
tuple1=("Apple",True,30)
print("Tuple : ",tuple1)
```
output:
```
Tuple :  ('Apple', True, 30)
```

7.Write a Python program to check whether an element exists within a tuple.

Program:
```
a=input("enter the element you want to search in the tuple: ")
tuple1=("Dog","cat",True,50,20)
len_tuple1=len(tuple1)
for i in range(0,len_tuple1):
    if(a==tuple1[i]):
        print("Element exist within the tuple")
```
output:
```
enter the element you want to search in the tuple: Dog
Element exist within the tuple
```

Week - 4: Sets, Dictionaries and Strings

1. Write a function called is_sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.

Program:

```
def is_sorted(input_list):
    for i in range(len(input_list) - 1):
        if input_list[i] > input_list[i + 1]:
            return False
    return True
list1 = [1, 2, 3, 4, 5]
list2 = [5, 3, 8, 2, 10]

print(is_sorted(list1))
print(is_sorted(list2))
```

output:

```
True
False
```

2. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

Program:

```
def as_duplicate(list1):
    a=len(list1)
    for i in range(0,a+1):
        for j in range(i+1,a):
            if(list1[i]==list1[j]):
                return True
    return False
list1=[1,2,6,4,5,1]
c=as_duplicate(list1)
print(c)
```

output:

```
True
```

i). Write a function called remove_duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.

Program:

```
def remove_duplicates(input_list):
    unique_list = list(set(input_list))
    return unique_list
original_list = [2, 3, 2, 5, 6, 5, 8, 2, 9]
new_list = remove_duplicates(original_list)
print(new_list)
```

output:

```
[2, 3, 5, 6, 8, 9]
```

ii). The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.

Program:

Output:

iii). Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.

Program:

```
original_dict = {'a': 1, 'b': 2, 'c': 3}
interchanged_dict = {value: key for key, value in original_dict.items()}

print(interchanged_dict)
```

output:

```
{1: 'a', 2: 'b', 3: 'c'}
```

**3. i) Add a comma between the characters. If the given word is 'Apple', it should
become 'A,p,p,l,e'.**

program:

```
x="apple"
y=','.join(x)
print(y)
```

output:

```
A,p,p,l,e
```

ii) Remove the given word in all the places in a string?

Program:

```
x="This is just a test."
y=x.replace("is","")
```

```
print(y)
```
output:

```
Th  just a test.
```

iii) Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?

Program:

```
def capitalizing(sentence):
    words = sentence.split()
    cap_words=[]
    for i in words:
        cap_words.append(i.capitalize())
    cap_sentence = ' '.join(cap_words)
    print(cap_sentence)
input_sentence = input("Enter a sentence: ")
capitalizing(input_sentence)
```

Output:

```
Enter a sentence: hello world hiii!

 Hello World Hii!
```

4. Writes a recursive function that generates all binary strings of n-bit length

Program:

```
def generate_binary_strings(n, prefix=""):
    if n == 0:
        print(prefix)
    else:
        generate_binary_strings(n - 1, prefix + "0")
        generate_binary_strings(n - 1, prefix + "1")

n_bits = 4
generate_binary_strings(n_bits)
```

output:

```
0000
0001
0010
0011
```

```
0100
0101
0110
0111
1000
1001
1010
1011
1100
1101
1110
1111
```

5. Write a Python program to implement all set operations

<u>Program:</u>

```
set1={1,2,3,4,5}
set2={3,4,5,6,7}
union_result=set1.union(set2)
union_intersection=set1.intersection(set2)
union_difference=set1.difference(set2)
symmetric_difference_result = set1.symmetric_difference(set2)
print("Union: ",union_result)
print("Intersection: ",union_intersection)
print("Difference : ",union_difference)
print("symmetric difference : ",symmetric_difference_result)
```

<u>output:</u>

```
Union:  {1, 2, 3, 4, 5, 6, 7}
Intersection:  {3, 4, 5}
Difference :  {1, 2}
symmetric difference :  {1, 2, 6, 7}
```

6. Write a program to check whether a string is palindrome or not.

<u>Program:</u>

```
def palindrome(x):
    for i in range(0,len(x)):
        if(x[i]==x[len(x)-i-1]):
            return True
        else:
            return False
Input=input("enter a string ")
c=palindrome(Input)
```

```
print(c)
```

output:

```
enter a string madam
True
```

Week - 5: Functions and Multi-D

1. **i) Write a python program that defines a matrix and prints**

   program:

```
matrix = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 9]
]
for row in matrix:
    print(row)
```

   output:

```
[1, 2, 3]
[4, 5, 6]
[7, 8, 9]
```

   ii) Write a python program to perform addition of two square matrices

   program:

```
def add_matrices(matrix1, matrix2):
    rows = len(matrix1)
    columns = len(matrix1[0])

    result = []
    for i in range(rows):
        row = []
        for j in range(columns):
            row.append(matrix1[i][j] + matrix2[i][j])
        result.append(row)

    return result

# Define two square matrices
matrix1 = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 9]
]

matrix2 = [
    [9, 8, 7],
    [6, 5, 4],
    [3, 2, 1]
]

# Perform matrix addition
result_matrix = add_matrices(matrix1, matrix2)

# Print the result
for row in result_matrix:
    print(row)
```

Output:

```
[10, 10, 10]
[10, 10, 10]
[10, 10, 10]
```

iii) Write a python program to perform multiplication of two square matrices.

Program:

```
def multiply_matrices(matrix1, matrix2):
    rows1 = len(matrix1)
    columns1 = len(matrix1[0])
    rows2 = len(matrix2)
    columns2 = len(matrix2[0])

    if columns1 != rows2:
        raise ValueError("Matrices cannot be multiplied due to incompatible
dimensions.")

    result = []
    for i in range(rows1):
        row = []
        for j in range(columns2):
            value = 0
            for k in range(columns1):
                value += matrix1[i][k] * matrix2[k][j]
            row.append(value)
        result.append(row)

    return result

# Define two square matrices
```

```
matrix1 = [
    [1, 2, 3],
    [4, 5, 6],
    [7, 8, 9]
]

matrix2 = [
    [9, 8, 7],
    [6, 5, 4],
    [3, 2, 1]
]

# Perform matrix multiplication
result_matrix = multiply_matrices(matrix1, matrix2)

# Print the result
for row in result_matrix:
    print(row)
```

output:

```
[30, 24, 18]
[84, 69, 54]
[138, 114, 90]
```

2. Simple Calculator program by making use of functions

Program:

```
def add(x, y):
    return x + y

def subtract(x, y):
    return x - y

def multiply(x, y):
    return x * y

def divide(x, y):
    if y == 0:
        return "Cannot divide by zero"
    return x / y

print("Select operation:")
print("1. Add")
print("2. Subtract")
print("3. Multiply")
print("4. Divide")

choice = input("Enter choice (1/2/3/4): ")

num1 = float(input("Enter first number: "))
num2 = float(input("Enter second number: "))

if choice == '1':
    print(num1, "+", num2, "=", add(num1, num2))
elif choice == '2':
    print(num1, "-", num2, "=", subtract(num1, num2))
elif choice == '3':
    print(num1, "*", num2, "=", multiply(num1, num2))
elif choice == '4':
    print(num1, "/", num2, "=", divide(num1, num2))
else:
    print("Invalid Input")
```

output:

```
Select operation:
1. Add
2. Subtract
3. Multiply
4. Divide
Enter choice (1/2/3/4): 1
Enter first number: 1
Enter second number: 2
1.0+ 2.0 = 3.0
```

3.Find the factorial of a number using recursion

Program:

```
def fact(a):
    if(a==0 or a==1):
        return 1
    else:
        return a*fact(a-1)
num=int(input("enter a number "))
factnum=fact(num)
print(factnum)
```

output:

```
enter a number 5
120
```

4. Write a function cumulative_ product to compute cumulative product of a list of
numbers.

<u>Program:</u>

```
def cumulative_product(list1):
    a=len(list1)
    for i in range(0,a):
        if list1[i]==0 or list1[i]==1 :
            a=1
        else:
            a= a*list1[i]
    return a
list1=[1,2,3,4,5]
c=cumulative_product(list1)
print(c)
```

<u>output:</u>

```
120
```

5. Write a function reverse to print the given list in the reverse order.

<u>Program:</u>

```
def reverse_list(list1):
    list2=[]
    for i in range(len(list1) -1,-1,-1):
        list2.append(list1[i])
    return list2
list1=[1,2,3,4,5]
list2=reverse_list(list1)
print(list2)
```

<u>output:</u>

```
[5, 4, 3, 2, 1]
```

Week-6: Exceptions in Python

1. Write a program that detects an Exception

Program:

```
try:
   num1=int(input("enter an number"))
   num2=int(input("enter other number"))
   result=num1/num2
   print("result:",result)
except ZeroDivisionError:
   print("Division by zero is not accepted")
except ValueError:
   print("enter only integers")
except Exception as e:
   print("an error occured",str(e))
output:
enter an number1
enter other number$
enter only integers
```

output:

```
enter an number1
enter other number0
Division by zero is not accepted
```

2. Write a program that raise an Exception (divide by zero error,voter's age validity

Program:

```
def voter_age(age):
   try:
      num=int(age)
      if(num>18):
         print("valid age")
      elif(num<18):
         print("not a valid age")
   except Exception as e:
      print("enter only integers:",str(e))
num=input("enter the age")
voter_age(num)
```

output:

```
enter the age&
enter only integers: invalid literal for int() with base 10: '&'
```

3. **Write a program that raise an Exception as string(), student mark range validation**

   <u>Program:</u>

```
def students_mark(marks):
    try:
        num=int(marks)
        if(num>0):
            print("valid number")
        elif(num<0 or num==0):
            print("not valid")
    except Exception as e:
        print("enter only integers :",str(e))
num=input("enter students marks")
students_mark(num)
```

   <u>output:</u>

```
enter students marks#$
enter only integers : invalid literal for int() with base 10: '#$'
```

4. **Use the structure of exception handling all general purpose exceptions.**

   <u>Program:</u>

```
try:
    num1=int(input("enter a number"))
    num2=int(input("enter other number"))
    result=num1/num2
    print("result : ",result)
except Exception as e:
    print("error occured :",str(e))
else:
    print("division successful")
finally:
    print("program completed successfully")
```

   <u>output:</u>

```
enter a number2
enter other number#
error occured : invalid literal for int() with base 10: '#'
program completed successfully
```

**5. Write a python code to read a phone number and email-id from the user and
validate it for correctness**

program:

```
import re
def Validate_phone(phone):
    pattern=r'^\d{10}$'
    if re.match(pattern,phone):
        return True
    else:
        return False
try:
    phone=input("enter phone number")
    if Validate_phone(phone):
        print("phone number is valid")
    else:
        print("phone number is not valid")
except Exception as e:
    print("exception : ",str(e))
```

output:

```
enter phone number!@#$%^&*()
phone number is not valid
```

program:

```
import re
def email_id(id):
    pattern=r'^[a-zA-Z0-9._+*-]+@[a-zA-Z0-9.-]+\.[a-zA-Z]{2,}$'
    if re.match(pattern,id):
        return True
    else:
        return False
try:
    id=input("enter your email-id")
    if(email_id(id)):
        print("id is correct")
    else:
        print("id is incorrect")
except Exception as e:
    print("Exception : ",str(e))
```

output:

```
enter your email-iddivya@gmail.com
id is correct
```

Week-7: Modules and Inheritance

1. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.

```
# geometry.py

import math

def square_area(side):

    return side * side

def square_perimeter(side):

    return 4 * side

def circle_area(radius):

    return math.pi * radius**2

def circle_circumference(radius):

    return 2 * math.pi * radius

def triangle_area(base, height):

    return 0.5 * base * height

def triangle_perimeter(side1, side2, side3):

    return side1 + side2 + side3

# main.py

import geometry

side_length = 5

radius = 3

base = 4

height = 6
```

```
side1 = 3

side2 = 4

side3 = 5

print("Square area:", geometry.square_area(side_length))

print("Square perimeter:", geometry.square_perimeter(side_length))

print("Circle area:", geometry.circle_area(radius))

print("Circle circumference:", geometry.circle_circumference(radius))

print("Triangle area:", geometry.triangle_area(base, height))

print("Triangle perimeter:", geometry.triangle_perimeter(side1, side2, side3))
```

```
Square area: 25

Square perimeter: 20

Circle area: 28.274333882308138

Circle circumference: 18.84955592153876

Triangle area: 12.0

Triangle perimeter: 12
```

2. a. Write a function called draw_rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.

Program:

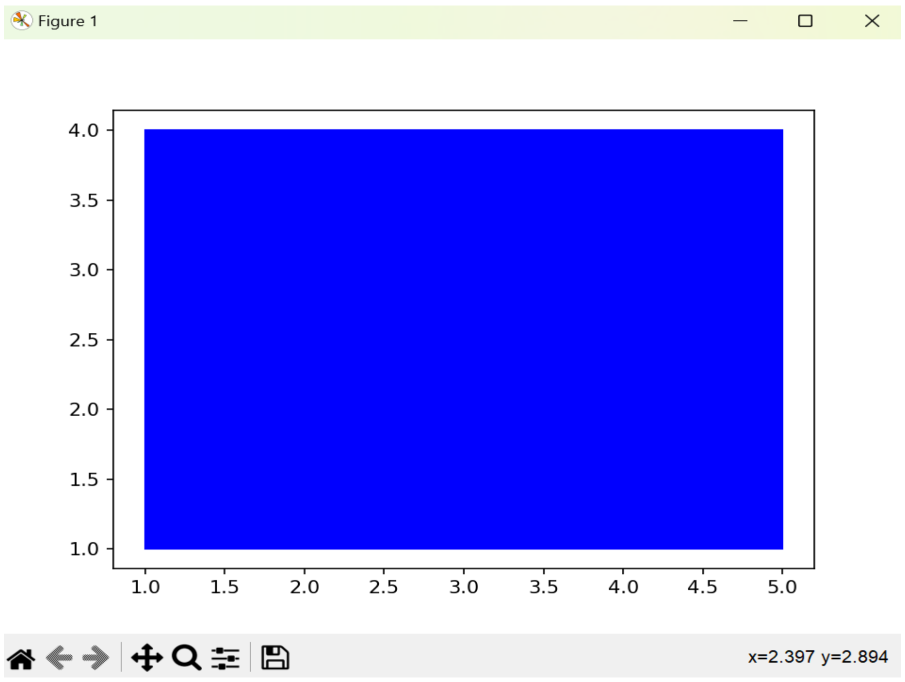
```
class Canvas:

    def _init_(self, width, height):

        self.width = width

        self.height = height
        self.grid = [[' ' for _ in range(width)] for _ in range(height)]

    def draw(self):
        for row in self.grid:
            print(' '.join(row))

class Rectangle:
    def _init_(self, x, y, width, height):
        self.x = x
        self.y = y
        self.width = width
        self.height = height

def draw_rectangle(canvas, rectangle):
    for row in range(rectangle.y, rectangle.y + rectangle.height):
        for col in range(rectangle.x, rectangle.x + rectangle.width):
            if row == rectangle.y or row == rectangle.y + rectangle.height - 1 or col == 
rectangle.x or col == rectangle.x + rectangle.width - 1:
                canvas.grid[row][col] = '#'
canvas = Canvas(10, 6)
rectangle = Rectangle(2, 1, 5, 3)
draw_rectangle(canvas, rectangle)
canvas.draw()
```

Output:

```
# # # # #
#          #
# # # # #
```

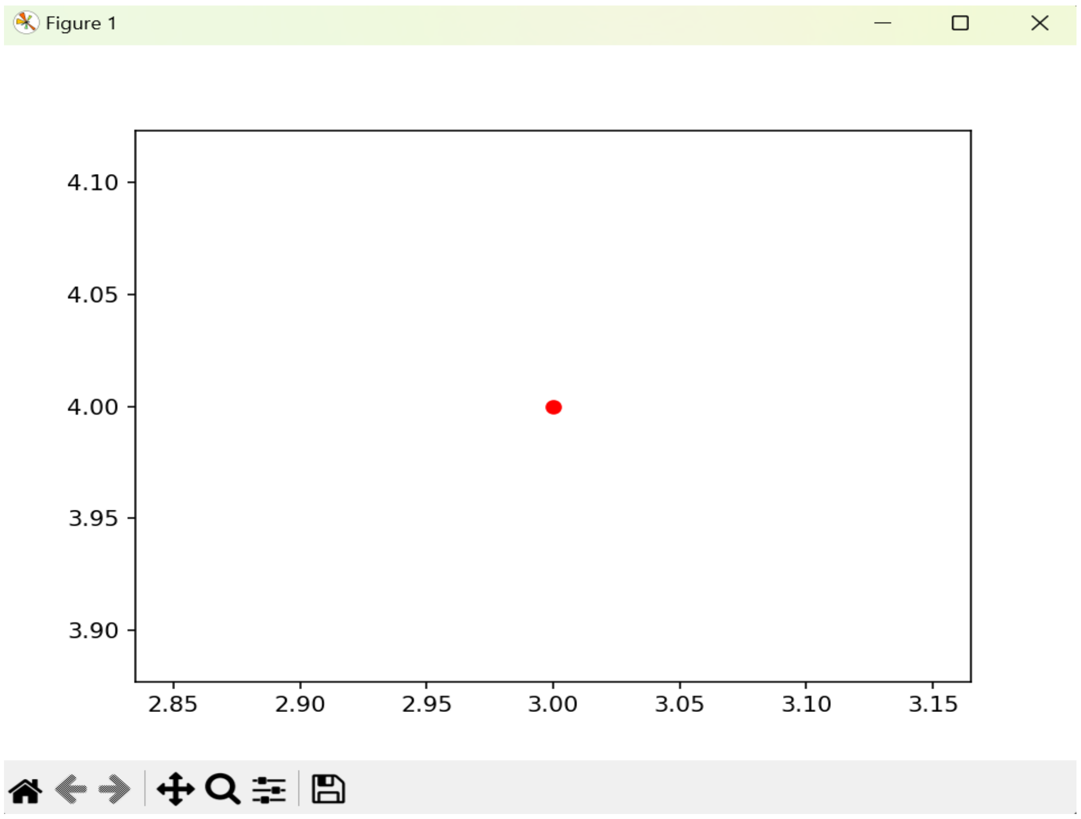
b. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.

```
import matplotlib.pyplot as plt

import matplotlib.patches as patches


class Canvas:


    def __init__(self):

        self.fig, self.ax = plt.subplots()


    def draw_rectangle(self, rectangle):

        x = rectangle.x

        y = rectangle.y

        width = rectangle.width

        height = rectangle.height

        color = rectangle.color

        rect = patches.Rectangle((x, y), width, height, color=color)
        self.ax.add_patch(rect)

    def show(self):
        plt.axis('equal')
        plt.show()

class Rectangle:

    def __init__(self, x, y, width, height, color):
        self.x = x
        self.y = y
        self.width = width
        self.height = height
        self.color = color

# Example usage:
canvas = Canvas()
rectangle1 = Rectangle(1, 1, 4, 3, "blue")
canvas.draw_rectangle(rectangle1)
canvas.show()
```



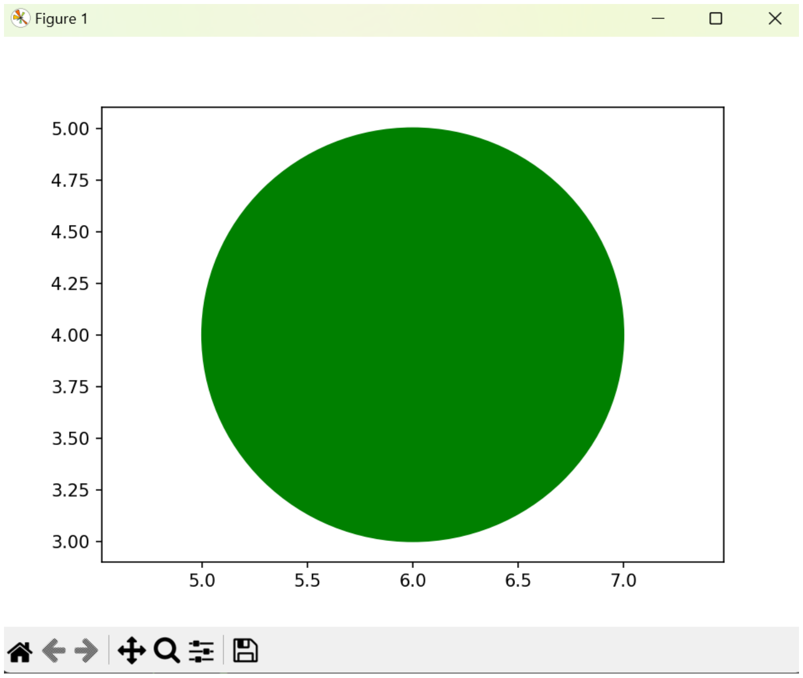
**c. Write a function called draw_point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas. **

```
import matplotlib.pyplot as plt

import matplotlib.patches as patches


class Canvas:


    def __init__(self):

        self.fig, self.ax = plt.subplots()


    def draw_point(self, point):
        x = point.x
        y = point.y
        plt.plot(x, y, 'ro')

    def show(self):
        plt.axis('equal')
        plt.show()

class Point:

    def __init__(self, x, y):
        self.x = x
        self.y = y
# Example usage:
canvas = Canvas()
point1 = Point(3, 4)
canvas.draw_point(point1)
canvas.show()
```



d. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw_circle that draws circles on the canvas.

```
import matplotlib.pyplot as plt

import matplotlib.patches as patches


class Canvas:


    def __init__(self):

        self.fig, self.ax = plt.subplots()
    def draw_circle(self, circle):
        x = circle.x
        y = circle.y
        radius = circle.radius
        color = circle.color
        circle = patches.Circle((x, y), radius, color=color)
        self.ax.add_patch(circle)

    def show(self):
        plt.axis('equal')
        plt.show()

class Circle:

    def __init__(self, x, y, radius, color):
        self.x = x
        self.y = y
        self.radius = radius
        self.color = color
# Example usage:
canvas = Canvas()
circle1 = Circle(6, 4, 1, "green")
canvas.draw_circle(circle1)
canvas.show()
```



3. Write a Python program to demonstrate the usage of Method Resolution Order (MRO) in multiple levels of Inheritance.

Program:

```
class A:
    def show(self):
        print("A class method")


class B(A):
    def show(self):
        print("B class method")


class C(A):
    def show(self):
        print("C class method")


class D(B, C):
    def show(self):
        print("D class method")


# Instantiate the D class object and call the show method
d_obj = D()
d_obj.show()


# Print the Method Resolution Order for class D
print(D.mro())
```

Output:

```
D class method
[<class '__main__.D'>, <class '__main__.B'>, <class '__main__.C'>, <class
'__main__.A'>, <class 'object'>]
```

Week- 8: Files

1. Write a Python code to merge two given file contents into a third file.

Program:

```
file1=open("t1.txt","w",encoding="utf-8")

file2=open("t2.txt","w")

file1.write("hello")

file2.write("world!")

file1.close()

file2.close()

file1=open("t1.txt","r")

data1=file1.read()

file2=open("t2.txt","r")

data2=file2.read()

file1.close()

file2.close()

file3=open("t3.txt","w")

file3.write(data1+" "+data2)

file3.close()

file3=open("t3.txt","r")

data=file3.read()

file3.close()
```

Output:

```
t1.txt:

hello

t2.txt:

world!

t3.txt:

hello world!
```

2. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.

Program:

```
file=open("t3.txt","r")

data=file.read()                    #t3.txt: hello world!

file.close()

def check_word(data,word):


    words=data.split(" ")

    for i in words:

        if word==i:

            print("word found")

            break

    else:
        print("not found")
word=input("Enter word to be searched:")
check_word(data,word)
```

Output:

```
Enter word to be searched:hello
Word found
```

3. Write a Python code to Read text from a text file, find the word with most number of occurrences.

Program:

```
count=0
max_count=0
words=[]
file=open("text.txt","r")    # apple banana apple mango banana mango orange mango
for line in file:
    string=line.lower().replace(',','').replace('.','').split(" ")
    for s in string:
        words.append(s)
for i in range (0,len(words)):
    count=1
    for j in range (i+1,len(words)):
        if words[i]==words[j]:
            count=count+1
        if count>max_count:
            max_count=count
            word=words[i]
print("Most repeated word:",word)
```

output

```
Most repeated word:mango
```

4. Write a function that reads a file file1 and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.

Program:

```
file1 = open("text.txt", "r")
data=file1.read()  #hello world
file1.close()
def diaplay():
    vowel= 0
    space=0
    con=0
    lower=0
    upper=0
```

```
vowels = ['a', 'e', 'i', 'o', 'u', 'A', 'E', 'I', 'O', 'U']
words=data.split()
print("Total words:",len(words))
for letter in data:
    if letter in vowels:
        vowel = vowel+1
    elif letter==" ":
            space=space+1
    else:
        con=con+1
    if letter.islower():
        lower=lower+1
    if letter.isupper():
        upper=upper+1

print("Total Vowels:")
print(vowel)
print("Total con:")
print(con)
print("Total lower:")
print(lower)
print("Total upper:")
print(upper)
```

```
    print("Total space:")
    print(space)
diaplay()
```

<u>optput:</u>

```
Total words: 2
Total Vowels:
3
Total con:
7
Total lower:
10
Total upper:
0
Total space:
1
```

5. Write a program to print each line of a file in reverse order.

<u>Program:</u>

```
file = open ("text.txt","r")
r=file.read()
word=r.split()
print(word)
l1 =[]
for i in word:
    l1.append(i[::-1])
print (l1)
```

<u>Output:</u>

```
['hello', 'world']
['olleh', 'dlrow']
```

Week - 9: Exploration of NumPy Package

1. Import numpy, and explore their functionalities.

Import NumPy:

```
   Impot numpy as np
```

Functionalities:

Creating Arrays:

Program:

```
import numpy as np
arr1 = np.array([10,20,30,40,50])
print(arr1)
print(type(arr1))
```

Output:

```
[10 20 30 40 50]
<class ‘numpy.ndarray’>
```

1-D Arrays

Program:

```
import numpy as np
 arr = np.array([1, 2, 3, 4, 5])
print(arr)
print(arr[0]
```

Output:

```
['1' '2' '3' '4' '5']
1
```

2-D Arrays

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr)
print(arr[1][1])
print(arr[1])
```

Output:

```
[[1 2 3]
      [4 5 6]]
5
 [4 5 6]
```

Dimension

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr.ndim)
```

Output:

```
 2
```

Size of each element (in bytes)

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr.itemsize)
```

Output:

```
4
```

Datatype

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr.dtype)
```

Output:

```
Int32
```

Size and Shape

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr.size)
print(arr.shape)
```

Output:

```
6
(2, 3)
```

Reshape

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
a=arr.reshape(3,2)
print(a)
```

Output:

```
[[1 2]
 [3 4]
 [5 6]]
```

Slicing

Program:

```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr[0:,2])
```

Output:

```
[3 6]
```

Min/Max/Sum

Program:

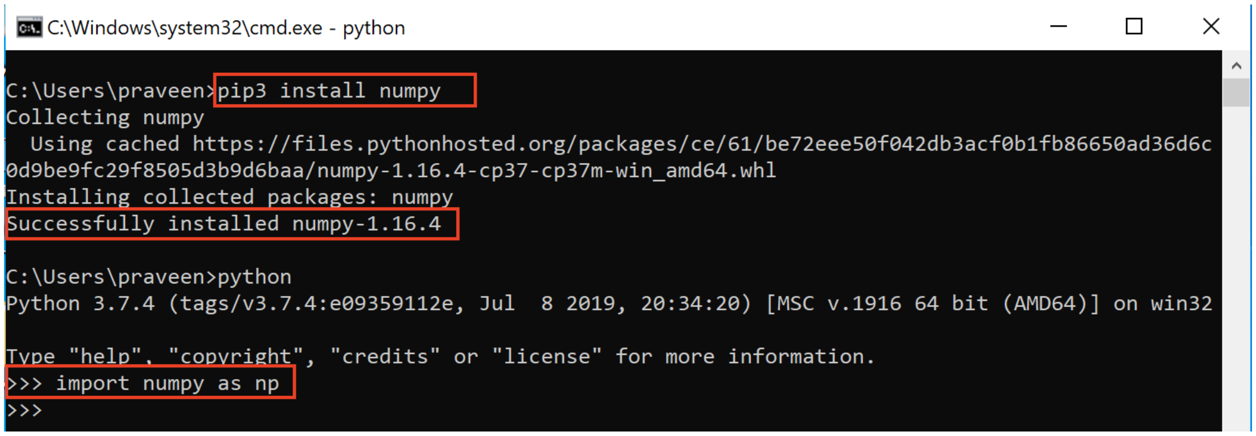
```
import numpy as np
arr = np.array([[1, 2, 3], [4, 5, 6]])
print(arr.min())
 print(arr.max())
print(arr.sum())
```

Output:

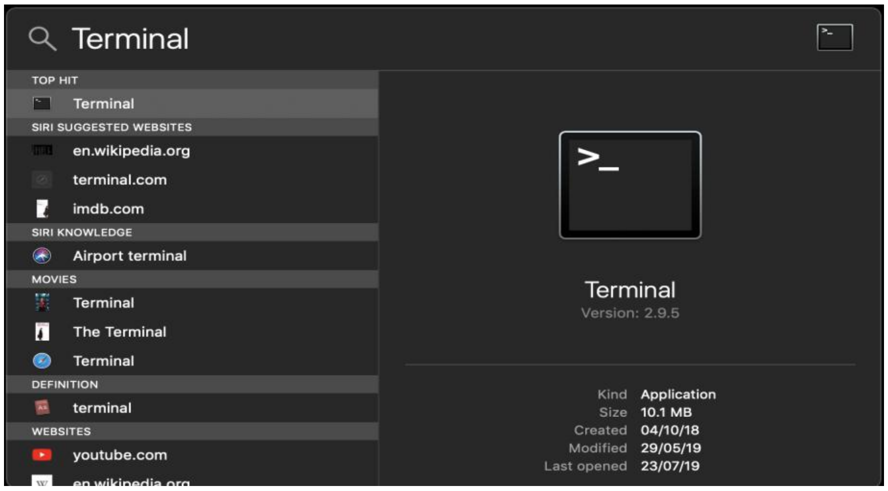
```
1
6
21
```

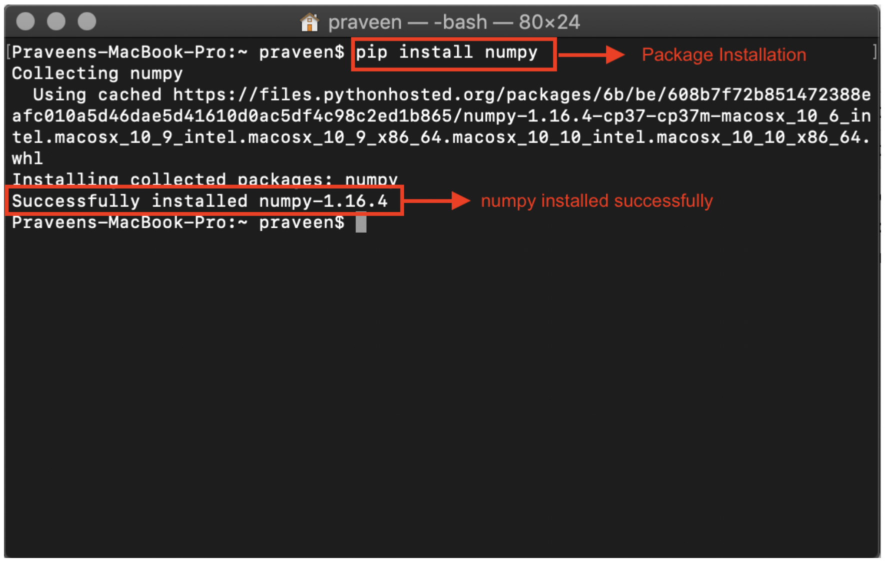
2. a) Install NumPy package with pip and explore it.

Python is not installed by default in windows operating system. You can download the required version of python from python.org. Once python is installed successfully, open command prompt and use pip to install numpy.

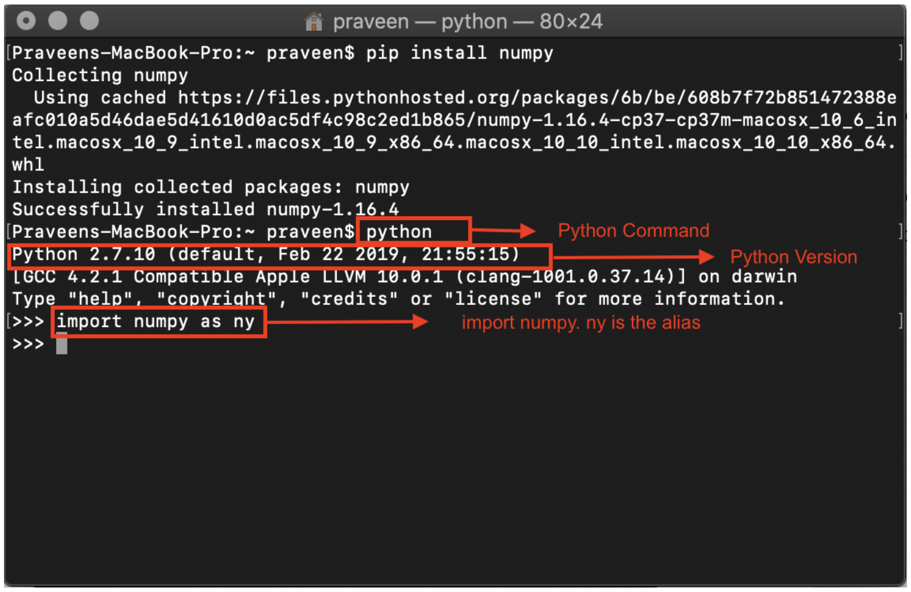


```
C:\Users\praveen>pip3 install numpy
Collecting numpy
  Using cached https://files.pythonhosted.org/packages/ce/61/be72eee50f042db3acf0b1fb86650ad36d6c
0d9be9fc29f8505d3b9d6baa/numpy-1.16.4-cp37-cp37m-win_amd64.whl
Installing collected packages: numpy
Successfully installed numpy-1.16.4

C:\Users\praveen>python
Python 3.7.4 (tags/v3.7.4:e09359112e, Jul  8 2019, 20:34:20) [MSC v.1916 64 bit (AMD64)] on win32

Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy as np
>>>
```





```
Praveens-MacBook-Pro:~ praveen$ pip install numpy
Collecting numpy
  Using cached https://files.pythonhosted.org/packages/6b/be/608b7f72b851472388e
afc010a5d46dae5d41610d0ac5df4c98c2ed1b865/numpy-1.16.4-cp37-cp37m-macosx_10_6_in
tel.macosx_10_9_intel.macosx_10_9_x86_64.macosx_10_10_intel.macosx_10_10_x86_64.
whl
Installing collected packages: numpy
Successfully installed numpy-1.16.4
Praveens-MacBook-Pro:~ praveen$
```



```
Praveens-MacBook-Pro:~ praveen$ pip install numpy
Collecting numpy
  Using cached https://files.pythonhosted.org/packages/6b/be/608b7f72b851472388e
afc010a5d46dae5d41610d0ac5df4c98c2ed1b865/numpy-1.16.4-cp37-cp37m-macosx_10_6_in
tel.macosx_10_9_intel.macosx_10_9_x86_64.macosx_10_10_intel.macosx_10_10_x86_64.
whl
Installing collected packages: numpy
Successfully installed numpy-1.16.4
Praveens-MacBook-Pro:~ praveen$ python
Python 2.7.10 (default, Feb 22 2019, 21:55:15)
[GCC 4.2.1 Compatible Apple LLVM 10.0.1 (clang-1001.0.37.14)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> import numpy as ny
>>>
```

3. Write a program for slicing arrays using numpy .

Program:

```
import numpy as np arr = np.
array([1, 2, 3, 4, 5, 6, 7])
print(arr[1:5])
print(arr[4:])
print(arr[:4])
print(arr[-3:-1])

print(arr[1:5:2])

print(arr[::2])
```

Output:

```
[2 3 4 5]
[5 6 7]
[1 2 3 4]
[5 6]
[2 4]
[1 3 5 7]
```

4. Write a program for Math operations on array using numpy.

- **Square Root and Standard Deviation**

  Program:

```
import numpy as np
arr=np.array([[1,2,3],[4,5,6]])
print(np.sqrt(arr))
print(np.std(arr))
```

Output:

```
[[1.         1.41421356 1.73205081]
 [2.         2.23606798 2.44948974]]
1.707825127659933
```

- **Addition, subtraction, multiplication and division of the two matrices**

Program:

```
import numpy as np
arr1=np.array([[1,2,3],[4,5,6]])
arr2=np.array([[1,2,3],[4,5,6]])
print(arr1+arr2)
print(arr1-arr2)
print(arr1*arr2)
print(arr1/arr2)
```

Output:

```
[[ 2  4  6]
 [ 8 10 12]]

[[0 0 0]
 [0 0 0]]

[[ 1  4  9]
 [16 25 36]]

[[1. 1. 1.]
 [1. 1. 1.]]
```

- **Vertical and Horizontal Stacking**

Program:

```
import numpy as np
arr1=np.array([[1,2,3],[4,5,6]])
arr2=np.array([[7,8,9],[10,11,12]])
print("vstack:",np.vstack((arr1,arr2)))
print("hstack:",np.hstack((arr1,arr2)))
```

Output:

```
vstack: [[ 1  2  3]
 [ 4  5  6]
 [ 7  8  9]
 [10 11 12]]
hstack: [[ 1  2  3  7  8  9]
```

```
 [ 4  5  6 10 11 12]]
```

- **Ravel:**

  Program:

  ```
  import numpy as np
  arr=np.array([[1,2,3],[4,5,6]])
  print(np.ravel(arr))
  ```

  Output:

  ```
  [1 2 3 4 5 6]
  ```

5. Write a program for searching .

Program:

```
import numpy as np
arr = np.array([10, 32, 30, 50, 20, 82, 91, 45])
i = np.where(arr == 30)
print(i)
```

Output:

```
(array([2], dtype=int64),)
```

6. Write a program for sorting.

Program:

```
import numpy as np
arr=np.array([[1,4,2,3],[9,13,61,1],[43,24,88,22]])
sort_arr=np.sort(arr)
print(sort_arr)
```

Output:

```
[[ 1  2  3  4]
 [ 1  9 13 61]
 [22 24 43 88]]
```

Week - 10: Exploration of Pandas Package

1. Import Pandas and Plotpy and explore their functionalities.

- **Pandas**

Import panda

Or

Import pandas as pd

Pandas Series:

Program:

```
Import pandas as pd
a=[1,2,3]
s=pd.series(a)
print(s)
```

Output:

```
0    1
1    2
2    3
dtype: int64
```

Labels:

Program:

```
import pandas as pd
a=[1,2,3]
s=pd.Series(a)
print(s[0])
```

Output:

```
1
```

Creating Labels:

Program

```
import pandas as pd
a=[1,2,3]
s=pd.Series(a,index= 'a','b','c')
print(s)
```

Output:

```
a    1
b    2
c    3
```

- **<u>Plotpy</u>**

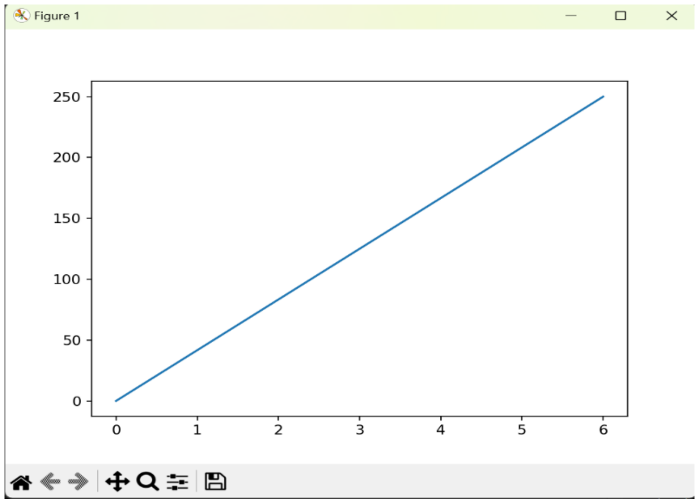
<u>import matplotlib.pyplot as plt</u>

<u>Matplotlib Line Plot:</u>

<u>Program:</u>

```
import matplotlib.pyplot as plt
import numpy as np
xpoints = np.array([0, 6])
ypoints = np.array([0, 250])
plt.plot(xpoints, ypoints)
plt.show()
```

<u>output:</u>



2. Python Data Frame

<u>DataFrames:</u>

<u>Program:</u>

```
 import pandas as pd
a={"Fruits":["apple","mango","kiwi"], "Qty.":[1,2,3],
"color":["red","Yellow","Rust"] }
df=pd.DataFrame(a)
print(df)
```

<u>Output:</u>

```
Fruits  Qty.   color
0  apple     1     red
1  mango     2  Yellow
```

```
2   kiwi     3    Rust
```

Index in DataFrame:

Program:

```
import pandas as pd

a={

"Fruits":["apple","mango","kiwi"],
"Qty":[1,2,3]
}
df=pd.DataFrame(a,index=["x","y","z"])
print(df)
```

output:

```
   Fruits     Qty
x   apple      1
y   mango    2
z   kiwi        3
```

Loc :

Program:

```
import pandas as pd
a={
"Fruits":["apple","mango","kiwi"],
"Qty":[1,2,3]
}
df=pd.DataFrame(a,index=["x","y","z"])
```

Output:

```
print(df.loc["x"])
Fruits    apple
Qty           1
Name: x, dtype: object
```

Week 11

1. Import SciPy and explore their functionalities.

Program

```
from scipy import special
a = special.exp10(3)
print(a)
 b = special.exp2(3)
print(b)
 c = special.sindg(90)
print(c)
 d = special.cosdg(45)
print(d)
```

output:

```
1000.0
8.0
1.0
0.7071067811865475
```

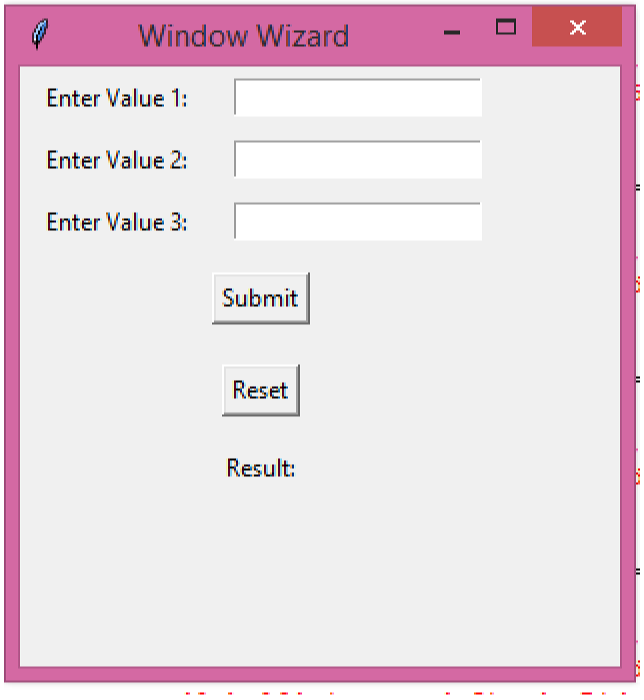
2. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

Program:

```
import tkinter as tk

def submit():
    value1 = entry1.get()
    value2 = entry2.get()
    value3 = entry3.get()
    label_result.config(text=f"Value 1: {value1}\nValue 2: {value2}\nValue 3:
{value3}")

def reset():
    entry1.delete(0, tk.END)
    entry2.delete(0, tk.END)
    entry3.delete(0, tk.END)
    label_result.config(text="Result:")

# Create the main window
root = tk.Tk()
```

```
root.geometry("300x300")
root.title("Window Wizard")

# Create labels
label1 = tk.Label(root, text="Enter Value 1:")
label2 = tk.Label(root, text="Enter Value 2:")
label3 = tk.Label(root, text="Enter Value 3:")

# Create entry fields
entry1 = tk.Entry(root)
entry2 = tk.Entry(root)
entry3 = tk.Entry(root)

# Create buttons
submit_button = tk.Button(root, text="Submit", command=submit)
reset_button = tk.Button(root, text="Reset", command=reset)

# Arrange widgets using grid layout
label1.grid(row=0, column=0, padx=10, pady=5)
entry1.grid(row=0, column=1, padx=10, pady=5)
label2.grid(row=1, column=0, padx=10, pady=5)
entry2.grid(row=1, column=1, padx=10, pady=5)
label3.grid(row=2, column=0, padx=10, pady=5)
entry3.grid(row=2, column=1, padx=10, pady=5)
submit_button.grid(row=3, column=0, columnspan=2, pady=10)
reset_button.grid(row=4, column=0, columnspan=2, pady=10)

label_result = tk.Label(root, text="Result:")
label_result.grid(row=5, column=0, columnspan=2, pady=5)

# Start the main event loop
root.mainloop().
```

Output:


Window Wizard
Enter Value 1:
Enter Value 2:
Enter Value 3:
Submit
Reset
Result:

Week 12

1.Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR

Program(and):

```
def AND(a,b):
    if a==1 and b==1:
        return True
    else:
        return False
print(AND(1,1),"=AND(1,1)")
print(AND(0,0),"=AND(0,0)")
print(AND(1,0),"=AND(1,0)")
print(AND(0,1),"=AND(0,1)")
```

output:

```
True =AND(1,1)
False =AND(0,0)
False =AND(1,0)
False =AND(0,1)
```

Program(or):

```
def OR(a,b):
    if a==1 or b==1:
        return True
    else:
        return False
print(OR(1,1),"=OR(1,1)")
print(OR(0,0),"=OR(0,0)")
print(OR(1,0),"=OR(1,0)")
print(OR(0,1),"=OR(0,1)")
```

output:

```
True =OR(1,1)
False =OR(0,0)
True =OR(1,0)
True =OR(0,1)
```

Program(not):

```
def NOT(a):
    if a==1 :
        return False
    else:
        return True
print(NOT(1),"=NOT(1)")
print(NOT(0),"=NOT(0)")
```
output:
```
False =NOT(1)
True =NOT(0)
```

Program(EX-OR):
```
def XOR_gate(a, b):
    if a != b:
        return 1
    else:
        return 0
print("XOR Gate:", XOR_gate(5,5))
```
output:
```
XOR Gate: 0
```

2. **Write a program to implement Half Adder, Full Adder, and Parallel Adder.**

Program(Half Adder):
```
def XOR(a,b):
    if a!=b:
        return 1
    else:
        return 0
def AND(a,b):
    if a==b:
        return 1
    else:
        return 0
def half_adder(a,b):
    sum=XOR(a,b)
    carry=AND(a,b)
    return sum,carry
sum,carry=half_adder(0,0)
print(sum,carry)
```

```
sum,carry=half_adder(0,1)
print(sum,carry)
sum,carry=half_adder(1,0)
print(sum,carry)
sum,carry=half_adder(1,1)
print(sum,carry)
```

output:

```
0 1
1 0
1 0
0 1
```

Program(full adder):

```
def half_adder(a,b):
    sum=a^b
    carry = a and b
    return carry,sum
def full_adder(carry_in,a,b):
    carry1,sum1=half_adder(carry_in,a)
    carry2,sum=half_adder(sum1,b)
    carry=carry1 or carry2
    return carry,sum
carry,sum=full_adder(0,0,0)
print(sum,carry)
carry,sum=full_adder(0,0,1)
print(sum,carry)
carry,sum=full_adder(0,1,0)
print(sum,carry)
carry,sum=full_adder(0,1,1)
print(sum,carry)
carry,sum=full_adder(1,0,0)
print(sum,carry)
carry,sum=full_adder(1,0,1)
print(sum,carry)
carry,sum=full_adder(1,1,0)
print(sum,carry)
carry,sum=full_adder(1,1,1)
print(sum,carry)
```

output:

```
0 0
1 0
```

```
1 0
0 1
1 0
0 1
0 1
1 1
```

Prallel Adder:

```
#
# To use these functions, you can run python and then import like -
# from binary_adder import *
#
# These methods carry out binary addition via 'digital logic'
# This is really what happens at the logic circuit level.
# So, this is a pretty abstract use of programming to illustrate
# what happens on silicon using code many, many, levels above that!
#

# A binary half adder -- performing addition only using logic operators,
# A half adder simply adds two bits and outputs a sum and carry
#
def half_adder(a, b):
    # ^ is logical xor in python
    sum = a ^ b
    carry = a and b
    return carry,sum

# A binary full adder
# The full adder can add 3 bits (can handle an incoming carry)
# Also returns a sum and carry
#
def full_adder(carry_in, a, b):
    carry1,sum1 = half_adder(carry_in,a)
    carry2,sum = half_adder(sum1,b)
    carry = carry1 or carry2
    return carry,sum

# This method virtually chains together binary full adders in order
# to add binary numbers of arbitrary size.
```

```
#
# a and b are expected to be strings representing binary integers.
#
#
def binary_adder(a,b):
    an = len(a)
    bn = len(b)

    # Convert strings to list of bits -- very functional syntax here
    al = list(int(x,2) for x in list(a))
    bl = list(int(x,2) for x in list(b))

    # Pad smaller list with 0's
    dif = an - bn
    # more digits in a than b
    if dif > 0:
        for i in range(dif):
            bl.insert(0,0)
    else:
        for i in range(abs(dif)):
            al.insert(0,0)

    print(al)
    print(bl)

    result = []
    carry = 0
    # Iterate through list right to left, calling full_adder each time and
    # inserting the sum each time
    for i in range(len(al)-1,-1,-1):
        carry,sum = full_adder(carry,al[i],bl[i])
        result.insert(0,sum)
        print (result)
    result.insert(0,carry)

    return ''.join(str(x) for x in result)

def test_binary_adder(a,b):
    result = binary_adder(a,b)
    print(result)
    if (int(a,2) + int(b,2)) == int(result,2):
        print("Woo hoo! It works")
    else:
        print("FAIL!!")
    print(str(int(a,2)) + " + " + str(int(b,2)) + " = " + str(int(result,2)))
test_binary_adder('11111','11111')
```

Output:

```
[1, 1, 1, 1, 1]
[1, 1, 1, 1, 1]
[0]
[1, 0]
[1, 1, 0]
[1, 1, 1, 0]
[1, 1, 1, 1, 0]
111110
Woo hoo! It works
31 + 31 = 62
```