JAGAN INSTITUTE OF MANAGEMENT STUDIES

SECTOR – 5, ROHINI,NEW DELHI

(Affiliated to)

GURU GOBIND SINGH INDRAPRASTHA UNIVERSITY

SECTOR – 16 C, DWARKA, NEW DELHI

PRACTICAL FILE : Python

Submitted To : Dr. Deepti Sharma
Professor(IT)

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MCA Ist Year (Section - A)[2nd Semester]

ACKNOWLEGEMENT

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Student Name : Shivansh

Enrollment No. : 00214004424

CERTIFICATE

This is certified to be the bonafide work of the student,

Name: **Shivansh** , Enrollment No.: **00214004424** for the purpose of subject **Python** of MCA, 2nd semester under the supervision of **Dr. Deepti Sharma** during the academic year 2025-2026.

Dr. Deepti Sharma

Professor (IT)

JIMS, Rohini

1. Find the Second Largest Element in a List

```
def second_largest(num_list):
    if len(num_list) < 2:
        return "List needs at least 2 elements"
    unique_sorted = sorted(set(num_list), reverse=True)
    return unique_sorted[1] if len(unique_sorted) > 1 else "No second largest element found"

Num = [10, 51, 2, 18, 4, 31, 13, 5, 23, 64, 29]
print("Second largest element:", second_largest(Num))
```

2. Remove Odd and Negative Numbers from a List

```
def remove_odd_and_negative(num_list):
    return [num for num in num_list if num % 2 == 0 and num > 0]

numbers = [10, -5, 51, 2, -18, 4, -31, 13, 5, -23, 64, 29]
print("After removing odd and negative numbers:", remove_odd_and_negative(numbers))
```

3. Find Elements Occurring Odd Number of Times

```
def find_odd_occurrence(num_list):
    count_dict = {}

    for num in num_list:
        count_dict[num] = count_dict.get(num, 0) + 1

    return [num for num, count in count_dict.items() if count % 2 != 0]

numbers = [1, 2, 3, 2, 3, 1, 3, 4, 5, 4, 5, 5]
print("Elements occurring odd number of times:", find_odd_occurrence(numbers))
```

4. Check if a String is a Palindrome

```
def is_palindrome(s):
    s = s.replace(" ", "").lower()
    return s == s[::-1]

test_strings = ["radar", "Hello", "A man a plan a canal Panama", "Python"]
for string in test_strings:
    print(f"'{string}' is palindrome: {is_palindrome(string)}")
```

5. Check if a Substring is Present in a String

```
def is_substring_present(main_string, substring):
    return substring in main_string

main = "Python Programming is fun"
print(is_substring_present(main, "Programming")) # True
print(is_substring_present(main, "Java")) # False
```

6. Check if Parentheses are Balanced

```
def has_balanced_parentheses(string):
    stack = []

    brackets = {')': '(', '}': '{', ']': '['}

    for char in string:
        if char in brackets.values():
            stack.append(char)
        elif char in brackets.keys():
            if not stack or stack.pop() != brackets[char]:
                return False

    return not stack

print(has_balanced_parentheses("({[]})")) # True
```

7. Find Letters in First String but Not in Second

```
def letters_in_first_only(str1, str2):
    return ''.join(sorted(set(str1) - set(str2)))

print(letters_in_first_only("programming", "coding")) # 'ampr'
```

8. Capitalize Every Other Letter in a String

```
def capitalize_alternate(s):
    return ''.join(s[i].upper() if i % 2 else s[i].lower() for i in range(len(s)))

print(capitalize_alternate("corona")) # 'cOrOnA'
```

9. Remove a Key from a Dictionary

```
def remove_key(dictionary, key):
    return dictionary.pop(key, f"Key '{key}' not found")

d = {'a': 1, 'b': 2, 'c': 3, 'd': 4}
print(remove_key(d, 'c')) # Key 'c' removed successfully
```

10. Count Word Frequency in a String

```
def count_word_frequency(text):
    for char in '.,;:!?"()[]{}':
        text = text.replace(char, '')
    words = text.lower().split()
    return {word: words.count(word) for word in set(words)}

text = "Python is a programming language. Python is fun."
print(count_word_frequency(text))
```

11. Store and Display Student Information

```
def store_student_info():
    students = {}

    n = int(input("Enter number of students: "))
    for _ in range(n):
        adm_num = input("Admission Number: ")
        students[adm_num] = {
            'roll_number': input("Roll Number: "),
            'name': input("Name: "),
            'marks': float(input("Marks: "))
        }

    return students
```

12. Find Sum of a Nested List Using Recursion

```
def calculate_sum(nested_list):
    return sum(calculate_sum(e) if isinstance(e, list) else e for e in nested_list)

nested_list = [1, 2, [3, 4], [5, [6, 7]], 8, [9, 10]]
print(calculate_sum(nested_list)) # 55
```

13. Append a String to a File

```
def append_to_file(filename, text):
    with open(filename, 'a') as file:
        file.write(text + '\n')

append_to_file("sample.txt", "This is a sample text")
```

14. Count Occurrences of a Word in a File

```
def count_word_in_file(filename, word):
    try:
        with open(filename, 'r') as file:
            content = file.read().lower()

        return content.split().count(word.lower())
    except FileNotFoundError:
        return "File not found"
```

15. Compare Two Files and Display Line Differences

```
def compare_files(file1, file2):
    with open(file1, 'r') as f1, open(file2, 'r') as f2:
        lines1, lines2 = f1.readlines(), f2.readlines()

    return f"File1: {len(lines1)} lines, File2: {len(lines2)} lines"
```

16. Find Index of a Key Using Linear Search

```
def linear_search(arr, key):
    return arr.index(key) if key in arr else -1

print(linear_search([10, 51, 2, 18], 18)) # 3
```

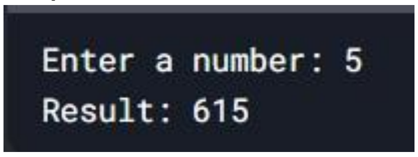
17. Sort a List Using Bubble Sort

```
def bubble_sort(arr):
    for i in range(len(arr)):
        for j in range(len(arr)-i-1):
            if arr[j] > arr[j+1]:
                arr[j], arr[j+1] = arr[j+1], arr[j]

    return arr

print(bubble_sort([10, 51, 2, 18])) # [2, 10, 18, 51]
```

18. Read a number n and compute n + nn + nnn

```
n = input("Enter a number: ")
nn = n + n
nnn = n + n + n
result = int(n) + int(nn) + int(nnn)
print(f"Result: {result}")
```

Output:

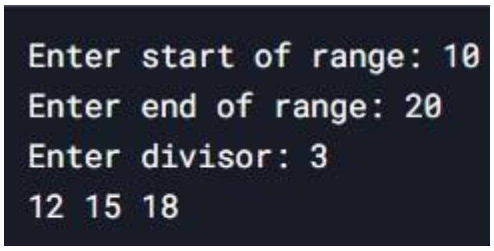


```
Enter a number: 5
Result: 615
```

19. Print all Numbers in a Range Divisible by a Given Number

```
start = int(input("Enter start of range: "))
end = int(input("Enter end of range: "))
divisor = int(input("Enter divisor: "))
for num in range(start, end + 1):
    if num % divisor == 0:
        print(num, end=" ")
```

Output:

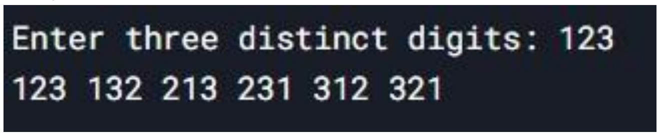


```
Enter start of range: 10
Enter end of range: 20
Enter divisor: 3
12 15 18
```

20. Accept three distinct digits and print all possible combinations

```
from itertools import permutations
digits = input("Enter three distinct digits: ")
combinations = permutations(digits, 3)
for combo in combinations:
    print("".join(combo), end=" ")
```

Output:

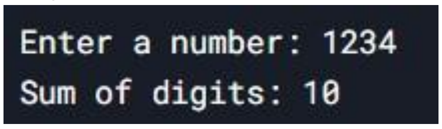


```
Enter three distinct digits: 123
123 132 213 231 312 321
```

21. Program to Find the Sum of Digits in a Number

```
num = input("Enter a number: ")
sum_digits = sum(int(digit) for digit in num)
print(f"Sum of digits: {sum_digits}")
```

Output:

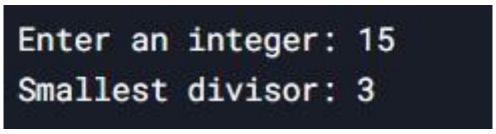


```
Enter a number: 1234
Sum of digits: 10
```

22. Program to Find the Smallest Divisor of an Integer (other than 1)

```
num = int(input("Enter an integer: "))
for i in range(2, num + 1):
    if num % i == 0:
        print(f"Smallest divisor: {i}")
        break
```

Output:

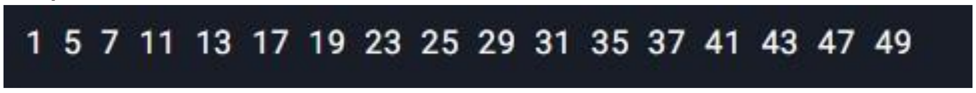


```
Enter an integer: 15
Smallest divisor: 3
```

23. Print all integers that are not divisible by either 2 or 3 and lie between 1 and 50

```
for num in range(1, 51):
    if num % 2 != 0 and num % 3 != 0:
        print(num, end=" ")
```

Output:

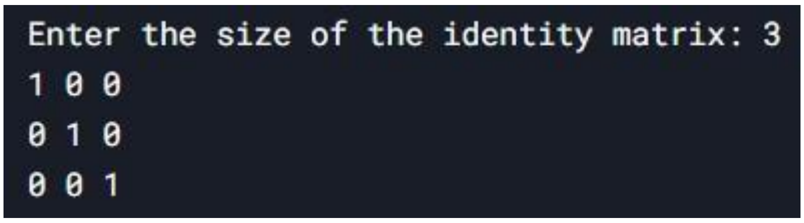


```
1 5 7 11 13 17 19 23 25 29 31 35 37 41 43 47 49
```

24. Accept a number n and print an identity matrix of N*N

```
n = int(input("Enter the size of the identity matrix: "))
for i in range(n):
    for j in range(n):
        print(1 if i == j else 0, end=" ")
    print()
```

Output:

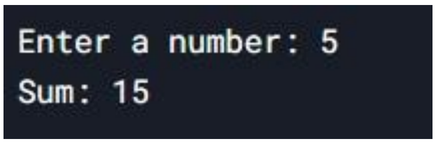


```
Enter the size of the identity matrix: 3
1 0 0
0 1 0
0 0 1
```

25. Compute the Value of 1 + 2 + 3 + ... + n

```
n = int(input("Enter a number: "))
result = n * (n + 1) // 2
print(f"Sum: {result}")
```

Output:

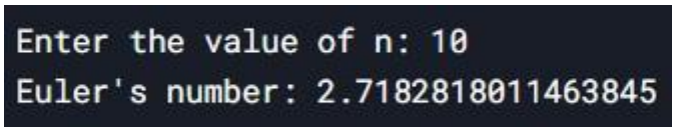


```
Enter a number: 5
Sum: 15
```

26. Compute Euler's Number (e)

```
import math
n = int(input("Enter the value of n: "))
e = sum(1 / math.factorial(i) for i in range(n + 1))
print(f"Euler's number: {e}")
```

Output:

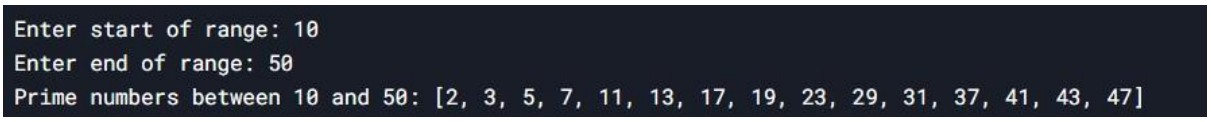


```
Enter the value of n: 10
Euler's number: 2.7182818011463845
```

27. Print Prime Numbers in a Range using Sieve of Eratosthenes

```
def sieve_of_eratosthenes(limit):
    primes = [True] * (limit + 1)
    primes[0] = primes[1] = False
    for num in range(2, int(limit**0.5) + 1):
        if primes[num]:
            for multiple in range(num * num, limit + 1, num):
                primes[multiple] = False
    return [num for num, is_prime in enumerate(primes) if is_prime]

start = int(input("Enter start of range: "))
end = int(input("Enter end of range: "))
print(f"Prime numbers between {start} and {end}: {sieve_of_eratosthenes(end)}")
```

Output:

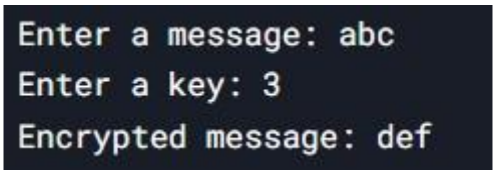


```
Enter start of range: 10
Enter end of range: 50
Prime numbers between 10 and 50: [2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47]
```

28. Write a program that encrypts a message by adding a key value to every character. (Caesar Cipher)

```
message = input("Enter a message: ")
key = int(input("Enter a key: "))
encrypted = "".join(chr(ord(char) + key) for char in message)
print(f"Encrypted message: {encrypted}")
```

Output:



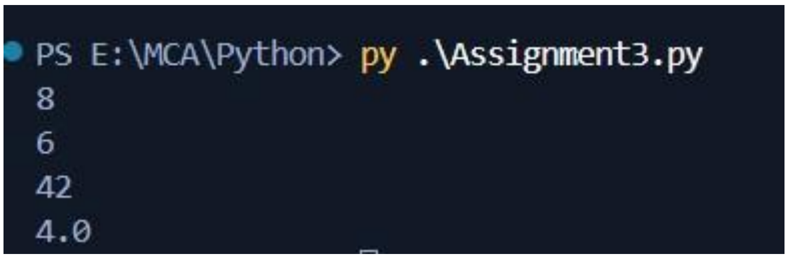
```
Enter a message: abc
Enter a key: 3
Encrypted message: def
```

Assignment - III

1. Create a Class which Performs Basic Calculator Operations

```
class Calculator:
    def add(self, a, b):
        return a + b

    def subtract(self, a, b):
        return a - b

    def multiply(self, a, b):
        return a * b

    def divide(self, a, b):
        if b == 0:
            return "Error! Division by zero."
        return a / b

calc = Calculator()
print(calc.add(5, 3))
print(calc.subtract(10, 4))
print(calc.multiply(6, 7))
print(calc.divide(8, 2))
```

Output:

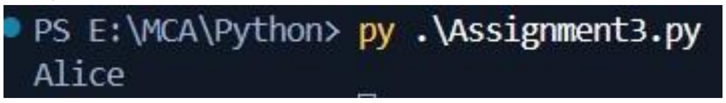


```
PS E:\MCA\Python> py .\Assignment3.py
8
6
42
4.0
```

2. Voting System

```
from collections import Counter

class VotingSystem:
    def __init__(self):
        self.votes = []

    def cast_vote(self, candidate_name):
        self.votes.append(candidate_name)

    def get_winner(self):
        if not self.votes:
            return "No votes cast"
        vote_count = Counter(self.votes)
        max_votes = max(vote_count.values())

        winners = sorted([name for name, count in vote_count.items() if count == max_votes])

        return winners[0]

# Example Usage
election = VotingSystem()
election.cast_vote("Alice")
election.cast_vote("Bob")
election.cast_vote("Alice")
election.cast_vote("Charlie")
election.cast_vote("Bob")

print(election.get_winner()) # Should print the lexicographically smallest winner
```

Output:

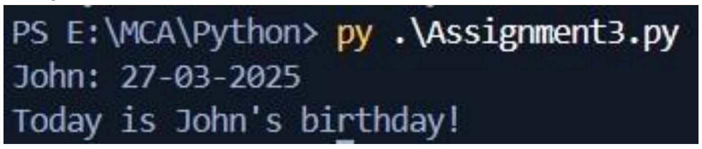


```
PS E:\MCA\Python> py .\Assignment3.py
Alice
```

3. Create Birthday Reminder Application

```
import datetime

class BirthdayReminder:
    def __init__(self, filename="birthdays.txt"):
        self.filename = filename

    def add_birthday(self, name, date_of_birth):
        try:
            with open(self.filename, "a") as file:
                file.write(f"{name},{date_of_birth}\n")
        except Exception as e:
            print("Error writing to file:", e)

    def show_birthdays(self):
        try:
            with open(self.filename, "r") as file:
                for line in file:
                    name, dob = line.strip().split(",")
                    print(f"{name}: {dob}")
        except FileNotFoundError:
            print("No birthdays found.")

    def check_today_birthdays(self):
        today = datetime.datetime.today().strftime("%d-%m")
        try:
            with open(self.filename, "r") as file:
                for line in file:
                    name, dob = line.strip().split(",")
                    if today in dob:
                        print(f"Today is {name}'s birthday!")
        except FileNotFoundError:
            print("No birthdays found.")

# Example Usage
reminder = BirthdayReminder()
reminder.add_birthday("John", "27-03-1995")
reminder.show_birthdays()
reminder.check_today_birthdays()
```

Output:



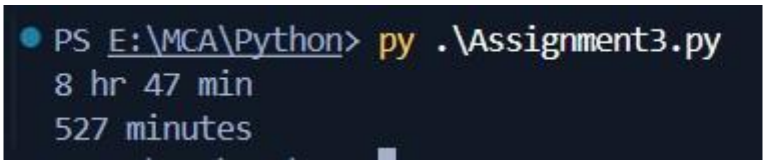
```
PS E:\MCA\Python> py .\Assignment3.py
John: 27-03-2025
Today is John's birthday!
```

4. Create a class "Time"

```
class Time:
    def __init__(self, hrs, mins):
        self.hrs = hrs
        self.mins = mins

    def add_time(self, other):
        total_mins = self.mins + other.mins
        total_hrs = self.hrs + other.hrs + total_mins // 60
        total_mins %= 60

        return Time(total_hrs, total_mins)

    def show_time(self):
        print(f"{self.hrs} hr {self.mins} min")

    def show_minute(self):
        print(self.hrs * 60 + self.mins, "minutes")
```

```
# Example Usage
t1 = Time(6, 35)
t2 = Time(2, 12)
t3 = t1.add_time(t2)
t3.show_time()
t3.show_minute()
```

Output:

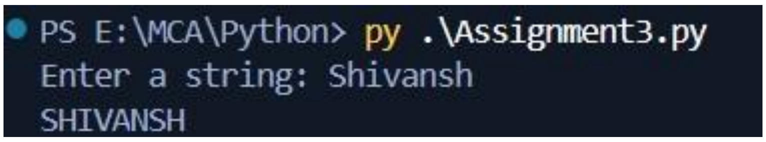


```
PS E:\MCA\Python> py .\Assignment3.py
8 hr 47 min
527 minutes
```

5. Write a Python class for string manipulation

```
class StringManipulation:
    def get_String(self):
        self.text = input("Enter a string: ")

    def print_String(self):
        print(self.text.upper())

# Example Usage
s = StringManipulation()
s.get_String()
s.print_String()
```

Output:

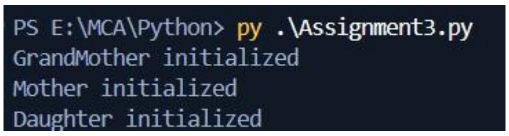


```
PS E:\MCA\Python> py .\Assignment3.py
Enter a string: Shivansh
SHIVANSH
```

6. Create class inheritance hierarchy

```
class GrandMother:
    def __init__(self):
        print("GrandMother initialized")

class Mother(GrandMother):
    def __init__(self):
        super().__init__()
        print("Mother initialized")

class Daughter(Mother):
    def __init__(self):
        super().__init__()
        print("Daughter initialized")

# Example Usage
d = Daughter()
```

Output:

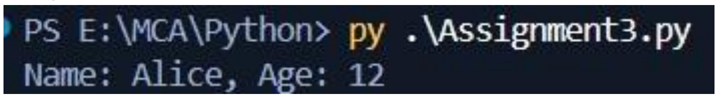


```
PS E:\MCA\Python> py .\Assignment3.py
GrandMother initialized
Mother initialized
Daughter initialized
```

7. Create a Parent-Child class relationship

```
class Parent:
    def __init__(self, name, age):
        self.name = name
        self.age = age

    def print_details(self):
        print(f"Name: {self.name}, Age: {self.age}")

class Child(Parent):
    def __init__(self, name, age):
        super().__init__(name, age)
        self.print_details()

# Example Usage
c = Child("Alice", 12)
```

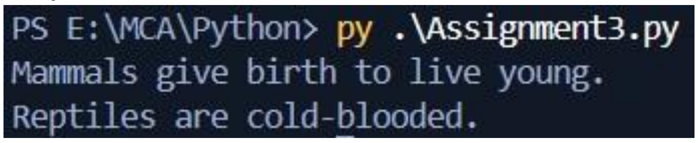
Output:

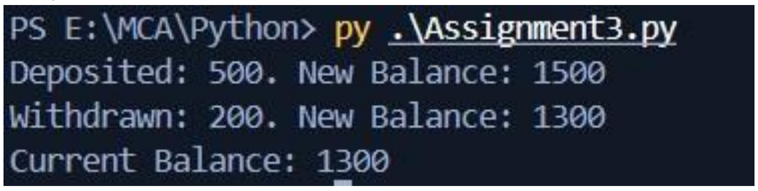


```
PS E:\MCA\Python> py .\Assignment3.py
Name: Alice, Age: 12
```

8. Create an abstract class with inherited subclasses

```
from abc import ABC, abstractmethod

class Animal(ABC):
    @abstractmethod
    def characteristic(self):
        pass

class Mammals(Animal):
    def characteristic(self):
        print("Mammals give birth to live young.")

class Reptiles(Animal):
    def characteristic(self):
        print("Reptiles are cold-blooded.")

class Birds(Animal):
    def characteristic(self):
        print("Birds have feathers and lay eggs.")

class Amphibians(Animal):
    def characteristic(self):
        print("Amphibians live both in water and on land.")
```

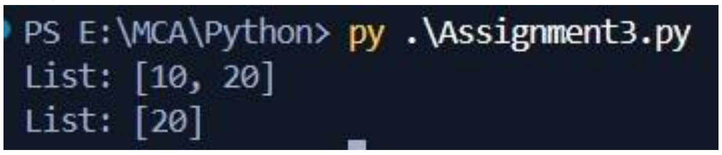
```
# Example Usage
m = Mammals()
m.characteristic()
r = Reptiles()
r.characteristic()
```
Output:

```
PS E:\MCA\Python> py .\Assignment3.py
Mammals give birth to live young.
Reptiles are cold-blooded.
```
9. Implement ATM simulation system

```
class ATM:
    def __init__(self, balance=0):
        self.balance = balance

    def deposit(self, amount):
        self.balance += amount
        print(f"Deposited: {amount}. New Balance: {self.balance}")

    def withdraw(self, amount):
        if amount > self.balance:
            print("Insufficient funds!")
        else:
            self.balance -= amount
            print(f"Withdrawn: {amount}. New Balance: {self.balance}")

    def check_balance(self):
        print(f"Current Balance: {self.balance}")

# Example Usage
atm = ATM(1000)
atm.deposit(500)
atm.withdraw(200)
atm.check_balance()
```
Output:

```
PS E:\MCA\Python> py .\Assignment3.py
Deposited: 500. New Balance: 1500
Withdrawn: 200. New Balance: 1300
Current Balance: 1300
```

10. Python Program to Append, Delete and Display Elements of a List Using Classes

```
class ListOperations:
    def __init__(self):
        self.lst = []

    def append_element(self, element):
        self.lst.append(element)
    def delete_element(self, element):
        if element in self.lst:
            self.lst.remove(element)
        else:
            print("Element not found!")

    def display_list(self):
        print("List:", self.lst)

# Example Usage
l = ListOperations()
l.append_element(10)
l.append_element(20)
l.display_list()
l.delete_element(10)
l.display_list()
```

Output:



```
PS E:\MCA\Python> py .\Assignment3.py
List: [10, 20]
List: [20]
```

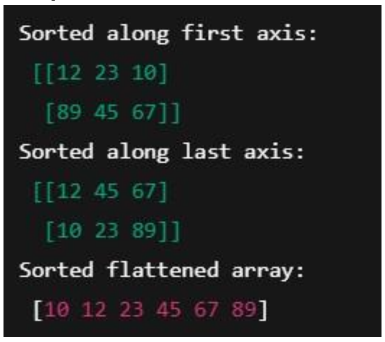
Assignment - IV

1. Sort a NumPy array along different axes

python

```
import numpy as np

arr = np.array([[12, 45, 67], [89, 23, 10]])

# Sort along the first axis (column-wise)
sorted_first_axis = np.sort(arr, axis=0)
print("Sorted along first axis:\n", sorted_first_axis)

# Sort along the last axis (row-wise)
sorted_last_axis = np.sort(arr, axis=1)
print("Sorted along last axis:\n", sorted_last_axis)

# Flattened sort
sorted_flattened = np.sort(arr, axis=None)
print("Sorted flattened array:\n", sorted_flattened)
```

Output:

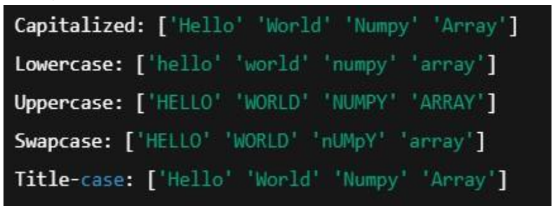


```
Sorted along first axis:
 [[12 23 10]
  [89 45 67]]
Sorted along last axis:
 [[12 45 67]
  [10 23 89]]
Sorted flattened array:
 [10 12 23 45 67 89]
```

2. String manipulations with NumPy arrays

```
import numpy as np

arr = np.array(['hello', 'world', 'NumPy', 'ARRAY'])

capitalized = np.char.capitalize(arr)
lowercase = np.char.lower(arr)
uppercase = np.char.upper(arr)
swapcase = np.char.swapcase(arr)
title_case = np.char.title(arr)

print("Capitalized:", capitalized)
print("Lowercase:", lowercase)
print("Uppercase:", uppercase)
print("Swapcase:", swapcase)
print("Title-case:", title_case)
```

Output:

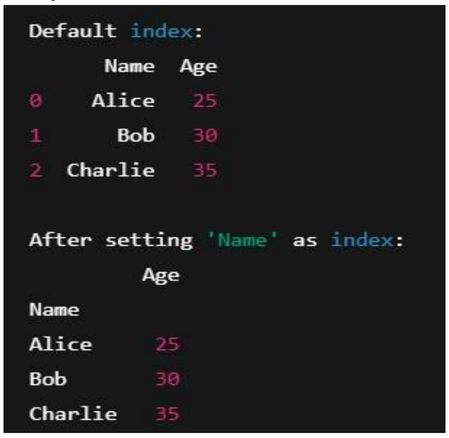


```
Capitalized: ['Hello' 'World' 'Numpy' 'Array']
Lowercase: ['hello' 'world' 'numpy' 'array']
Uppercase: ['HELLO' 'WORLD' 'NUMPY' 'ARRAY']
Swapcase: ['HELLO' 'WORLD' 'nUMpY' 'array']
Title-case: ['Hello' 'World' 'Numpy' 'Array']
```

3. Display default index and set column as index in Pandas

```
import pandas as pd

data = {'Name': ['Alice', 'Bob', 'Charlie'], 'Age': [25, 30, 35]}

df = pd.DataFrame(data)

print("Default index:")
print(df)

df_indexed = df.set_index('Name')
print("\nAfter setting 'Name' as index:")
print(df_indexed)
```

Output:

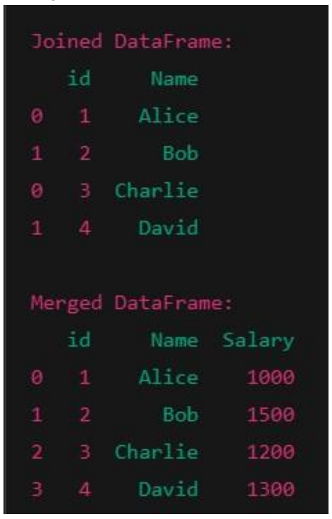


```
Default index:
      Name  Age
0    Alice   25
1      Bob   30
2  Charlie   35

After setting 'Name' as index:
         Age
Name
Alice     25
Bob       30
Charlie   35
```

4. Join and merge DataFrames in Pandas

```
df1 = pd.DataFrame({'id': [1, 2], 'Name': ['Alice', 'Bob']})
df2 = pd.DataFrame({'id': [3, 4], 'Name': ['Charlie', 'David']})
df3 = pd.DataFrame({'id': [1, 2, 3, 4], 'Salary': [1000, 1500, 1200, 1300]})

joined = pd.concat([df1, df2])
print("Joined DataFrame:\n", joined)

merged = pd.merge(joined, df3, on='id')
print("Merged DataFrame:\n", merged)
```

Output:

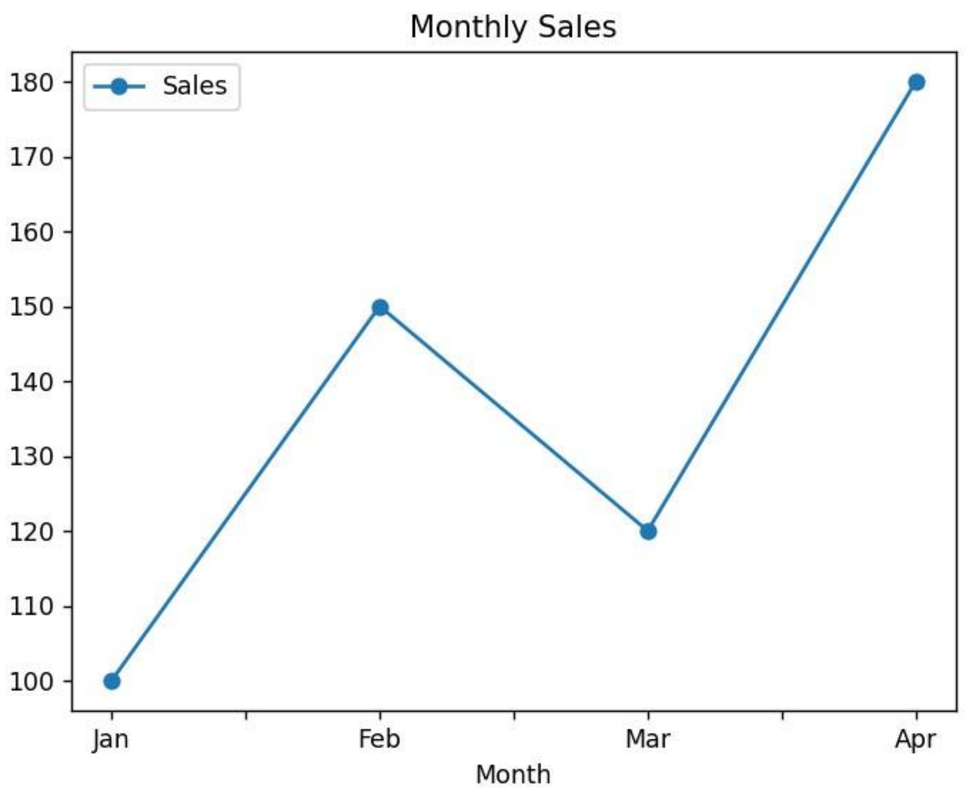


```
Joined DataFrame:
   id     Name
0   1    Alice
1   2      Bob
0   3  Charlie
1   4    David

Merged DataFrame:
   id     Name  Salary
0   1    Alice    1000
1   2      Bob    1500
2   3  Charlie    1200
3   4    David    1300
```

5. Analyze and visualize sales data

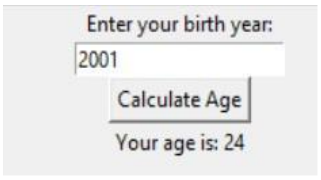
```
import pandas as pd
import matplotlib.pyplot as plt

sales_data = {'Month': ['Jan', 'Feb', 'Mar', 'Apr'],
        'Sales': [100, 150, 120, 180]}

df_sales = pd.DataFrame(sales_data)

df_sales.plot(kind='line', x='Month', y='Sales', marker='o', title='Monthly Sales')
plt.show()

df_sales.plot(kind='bar', x='Month', y='Sales', title='Monthly Sales (Bar)')
plt.show()

df_sales.set_index('Month')['Sales'].plot.pie(autopct='%1.1f%%', title='Sales Distribution')
plt.ylabel('')
plt.show()
```

Output:



6. Age calculator application using GUI widgets

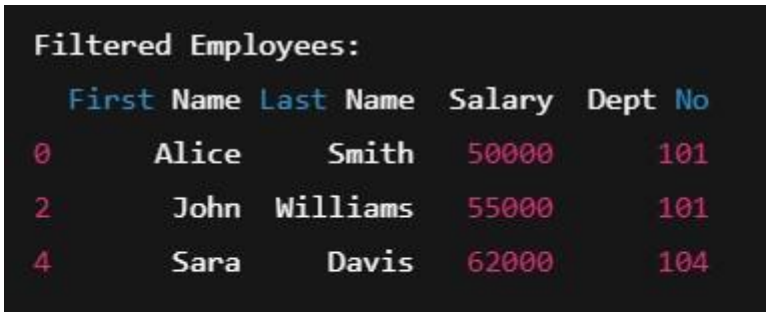
```
import tkinter as tk
from datetime import datetime

def calculate_age():
    birth_year = int(entry.get())
    current_year = datetime.now().year
    age = current_year - birth_year
    result_label.config(text=f"Your age is: {age}")

root = tk.Tk()
root.title("Age Calculator")

tk.Label(root, text="Enter your birth year:").pack()
entry = tk.Entry(root)
entry.pack()

tk.Button(root, text="Calculate Age", command=calculate_age).pack()
result_label = tk.Label(root, text="")
result_label.pack()

root.mainloop()
```
Output:



7. Filter employee data using Pandas

```
import pandas as pd

data = {
   'First Name': ['Alice', 'Mark', 'John', 'Michael', 'Sara'],
   'Last Name': ['Smith', 'Johnson', 'Williams', 'Brown', 'Davis'],
   'Salary': [50000, 60000, 55000, 58000, 62000],
   'Dept No': [101, 102, 101, 103, 104]
}

df = pd.DataFrame(data)

filtered = df[~df['First Name'].str.contains('m', case=False)]

print("Filtered Employees:\n", filtered[['First Name', 'Last Name', 'Salary', 'Dept No']])
```

Output:



```
Filtered Employees:
  First Name Last Name  Salary  Dept No
0      Alice     Smith   50000      101
2       John  Williams   55000      101
4       Sara     Davis   62000      104
```