Experiment: 2

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Subject: Python Lab

## Experiment – 2: Python Data Types

1. **Aim:** To implement a Python program showing different Python data types

2. **Objectives:** After performing this experiment, a student will be able to write a basic Python program using Python data types like Numeric, Sequences, Sets and Dictionaries.

3. **Prerequisite:** Python basics

4. **Requirements:** PC, Python 3.9, Windows 10/ MacOS/ Linux, IDLE IDE

5. **Pre-Experiment Exercise:**
   **Theory:**
   A data type represents the type of data stored into a variable or memory. The datatypes which are already available in Python are called built-in data types. The datatypes created by the programmer is called user-defined datatypes.
   The built-in data types are as follows:
   **Numeric**: The numeric data types represent numbers. There are three sub categories of numeric data types
   - **int** : int are positive or negative whole numbers with no decimal point. Integers in Python 3 are of unlimited size.
   - **float** : represent real numbers and are written with a decimal point dividing the integer and the fractional parts. Floats may also be in scientific notation, with E or e indicating the power of 10 (2.5e2 = 2.5 x $10^2$ = 250).
   - **complex** : are of the form a + bJ, where a and b are floats and J (or j) represents the square root of -1 (which is an imaginary number). The real part of the number is a, and the imaginary part is b. Complex numbers are not used much in Python programming.

   **Sequences:** A sequence represents a group of elements or items. There are six types of sequences in Python.
   - **str:** represents string datatype which is string of characters. Strings are constructed by using single or double quotes.
   - **bytes:** represents a group of byte numbers. A byte is any positive number between 0 to 255.
   - **bytearray:** similar to array of bytes. But the difference is array of bytes cannot be modified but the bytearray type array can be modified.
   - **list:** represents a group of elements. Lists can grow dynamically in memory. Lists are represented using square brackets and its elements are separated by commas.
   - **tuple:** contains a group of elements which can be of different types. The elements in the tuple are separated by commas and enclosed in parenthesis. Whereas the elements of a list can be modified, it is not possible to modify the tuple elements. A tuple can be treated as a read-only list.
   - **range:** represents a sequence of numbers. The numbers in the range are not modifiable.

   **Sets:** A set is an unordered, mutable collection of elements. Common uses include membership testing, removing duplicates from a sequence, and computing standard math operations on sets such as intersection, union, difference *etc*.
   - **set:** To create a set, elements separated by commas are entered curly braces. the same notation is used in Python.
   - **frozenset:** is similar to set except elements of frozenset cannot be modified.

   **Dictionary**: represents a group of elements arranged in the form of key value pairs. In the dictionary, first element is considered as a ‘key’ and immediate next value is considered as its ‘value’. The key and its value is separated by a colon. All the key value pairs are inserted in curly braces. Various methods are available to access and process the elements of a dictionary.

1. **Laboratory Exercise**

   **A. Procedure**

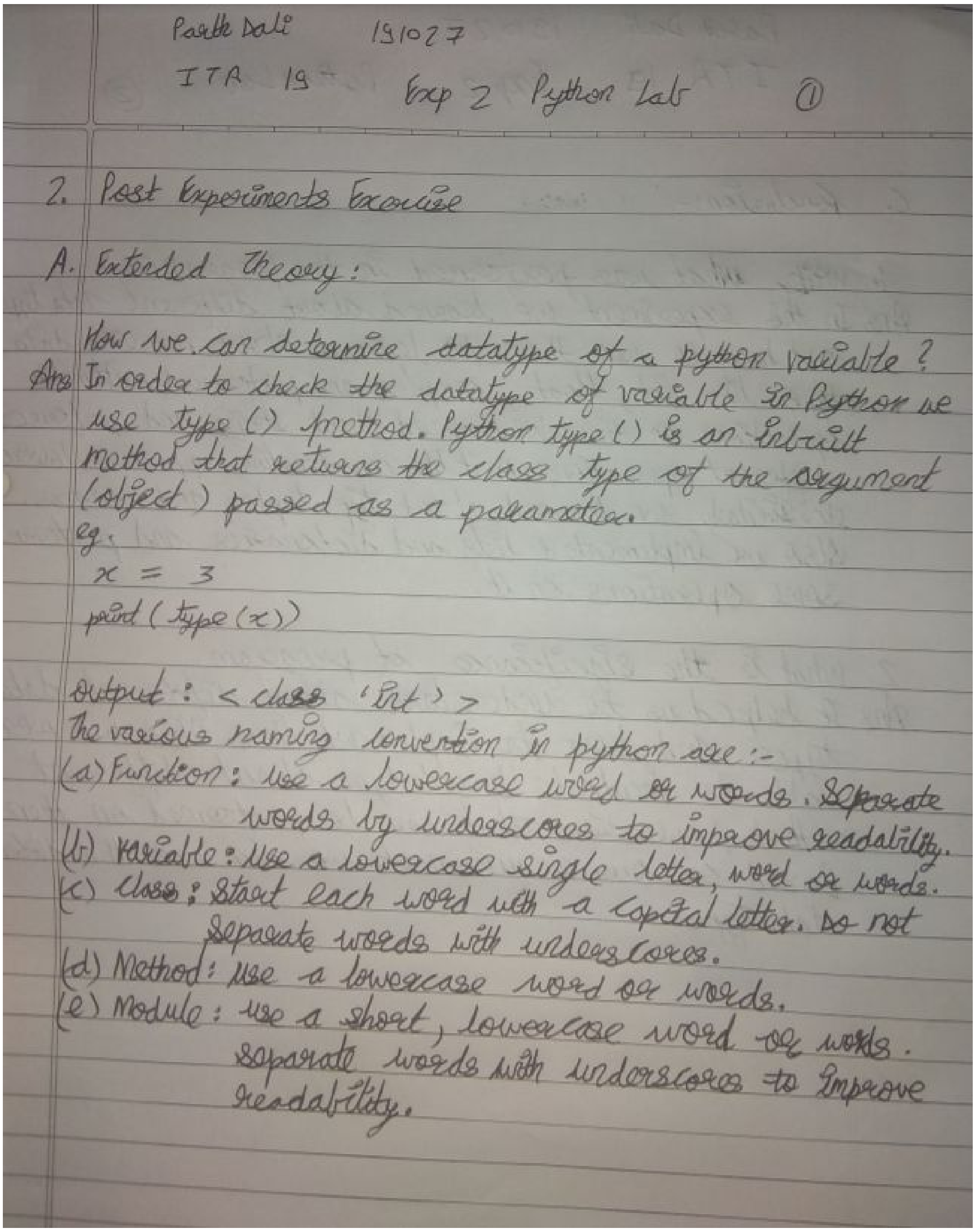
   i. Write a Python program to perform arithmetic operations on numeric data types.
   ii. Write a Python program to perform string uppercase, lowercase, concatenation and sub-string operations.
   iii. Write a Python program to create and display tuples and ranges.
   iv. Write a Python program to demonstrate various functions which can be performed on dictionary datatype.
   v. Add relevant comments in your programs and execute the code. Test it for various cases.

2. **Post-Experiments Exercise**

   **A. Extended Theory:**

   How we can determine datatype of a python variable? List down various naming conventions in Python.

   **Ans:**



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2. Post Experiments Exercise

A. Extended theory:

How we can determine datatype of a python variable?

Ans In order to check the datatype of variable in python we use type () method. Python type () is an inbuilt method that returns the class type of the argument (object) passed as a parameter.

eg.

```
x = 3
print (type (x))

output : < class 'int' >
```

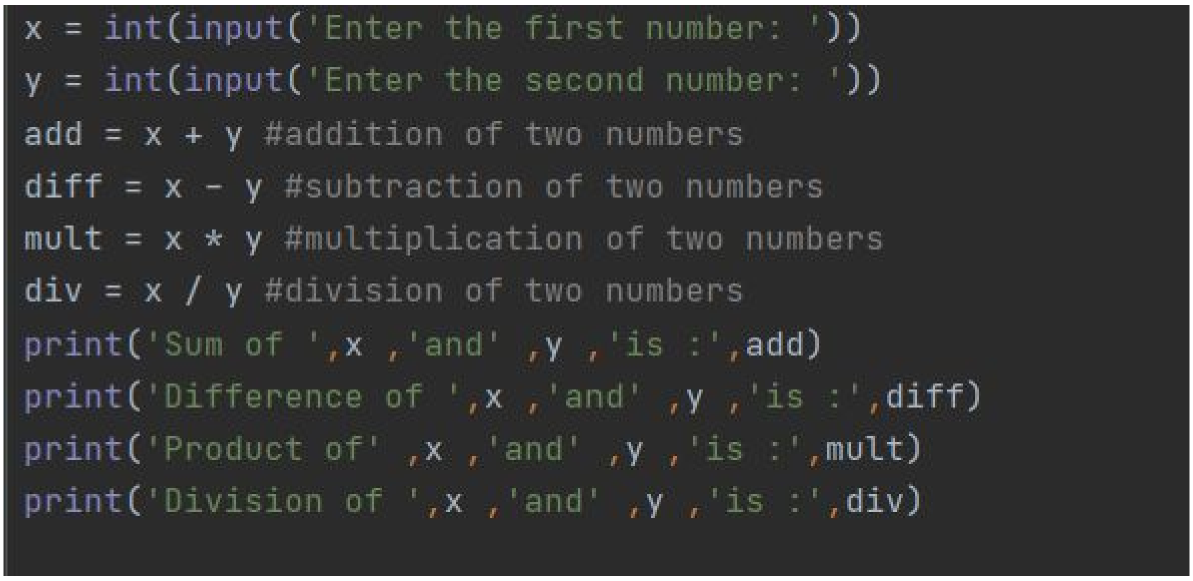
The various naming convention in python are :-

(a) Function : use a lowercase word or words. Separate words by underscores to improve readability.
(b) Variable : Use a lowercase single letter, word or words.
(c) Class : Start each word with a capital letter. Do not separate words with underscores.
(d) Method : use a lowercase word or words.
(e) Module : use a short, lowercase word or words. separate words with underscores to improve readability.

**B. Results/Observations/Program output:**

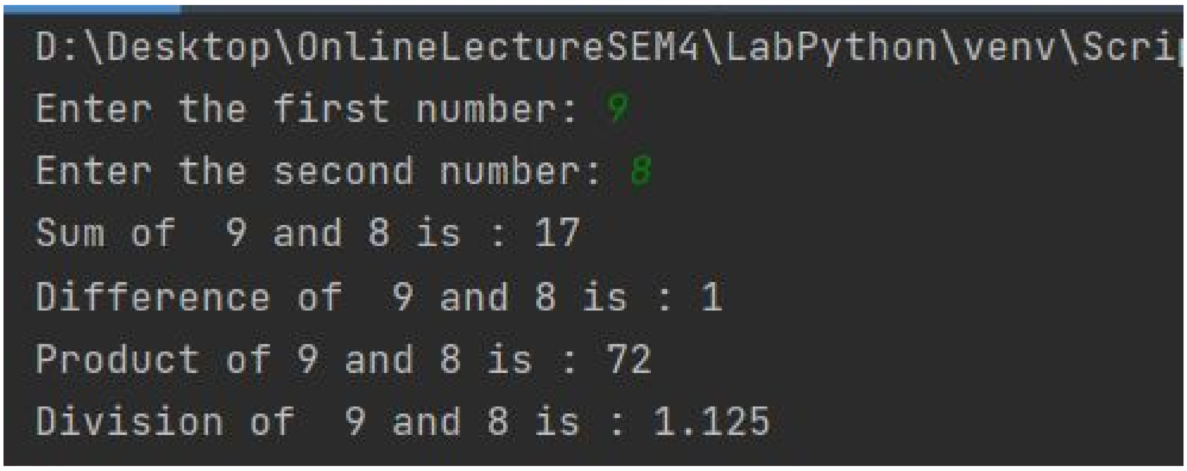
**Q i.**

**Program:**



```python
x = int(input('Enter the first number: '))
y = int(input('Enter the second number: '))
add = x + y #addition of two numbers
diff = x - y #subtraction of two numbers
mult = x * y #multiplication of two numbers
div = x / y #division of two numbers
print('Sum of ',x ,'and' ,y ,'is :',add)
print('Difference of ',x ,'and' ,y ,'is :',diff)
print('Product of' ,x ,'and' ,y ,'is :',mult)
print('Division of ',x ,'and' ,y ,'is :',div)
```

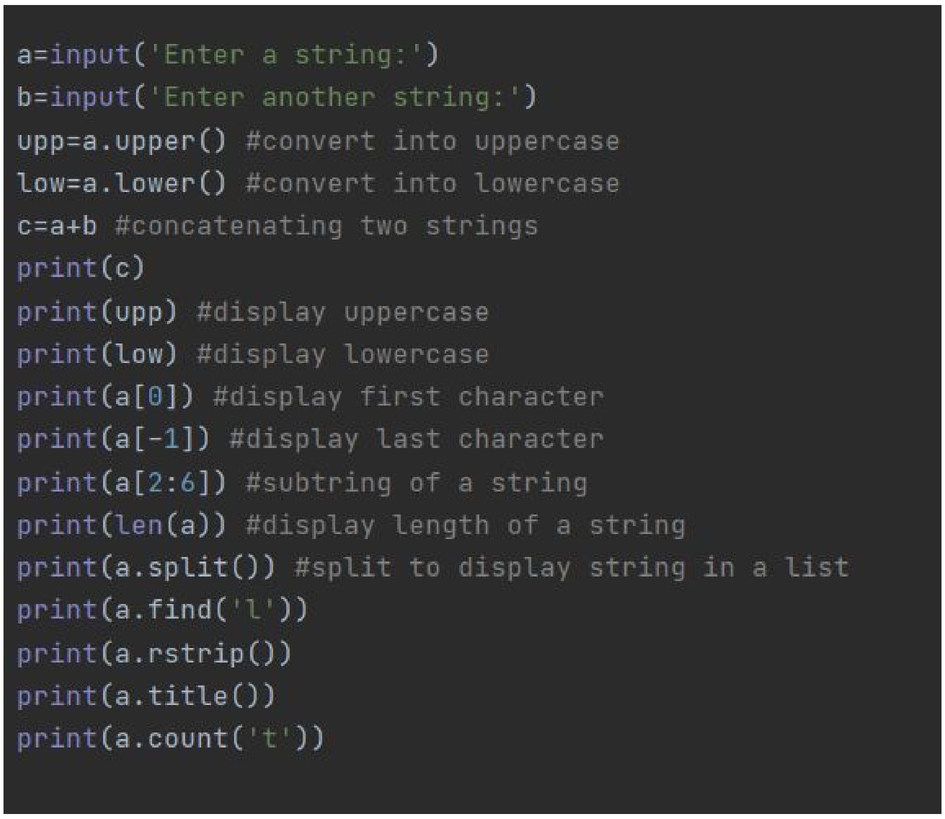
**Output:**



```
D:\Desktop\OnlineLectureSEM4\LabPython\venv\Scri
Enter the first number: 9
Enter the second number: 8
Sum of  9 and 8 is : 17
Difference of  9 and 8 is : 1
Product of 9 and 8 is : 72
Division of  9 and 8 is : 1.125
```

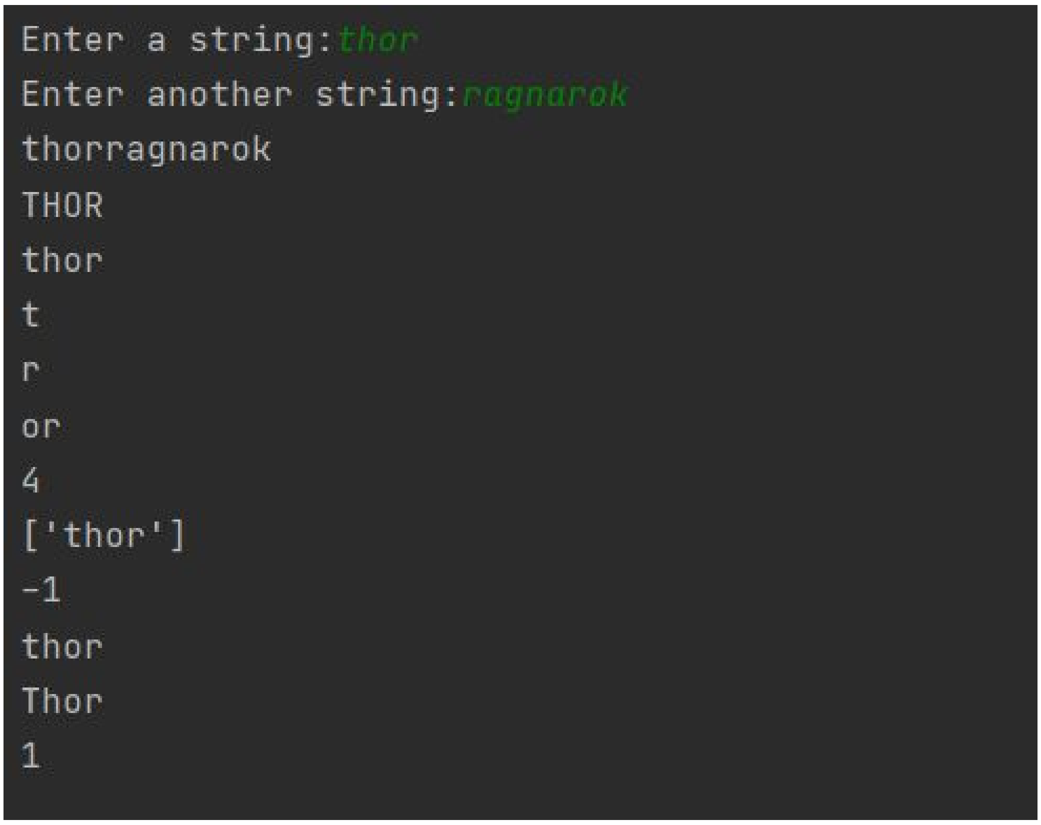
**Q ii.**

**Program:**



```python
a=input('Enter a string:')
b=input('Enter another string:')
upp=a.upper() #convert into uppercase
low=a.lower() #convert into lowercase
c=a+b #concatenating two strings
print(c)
print(upp) #display uppercase
print(low) #display lowercase
print(a[0]) #display first character
print(a[-1]) #display last character
print(a[2:6]) #subtring of a string
print(len(a)) #display length of a string
print(a.split()) #split to display string in a list
print(a.find('l'))
print(a.rstrip())
print(a.title())
print(a.count('t'))
```

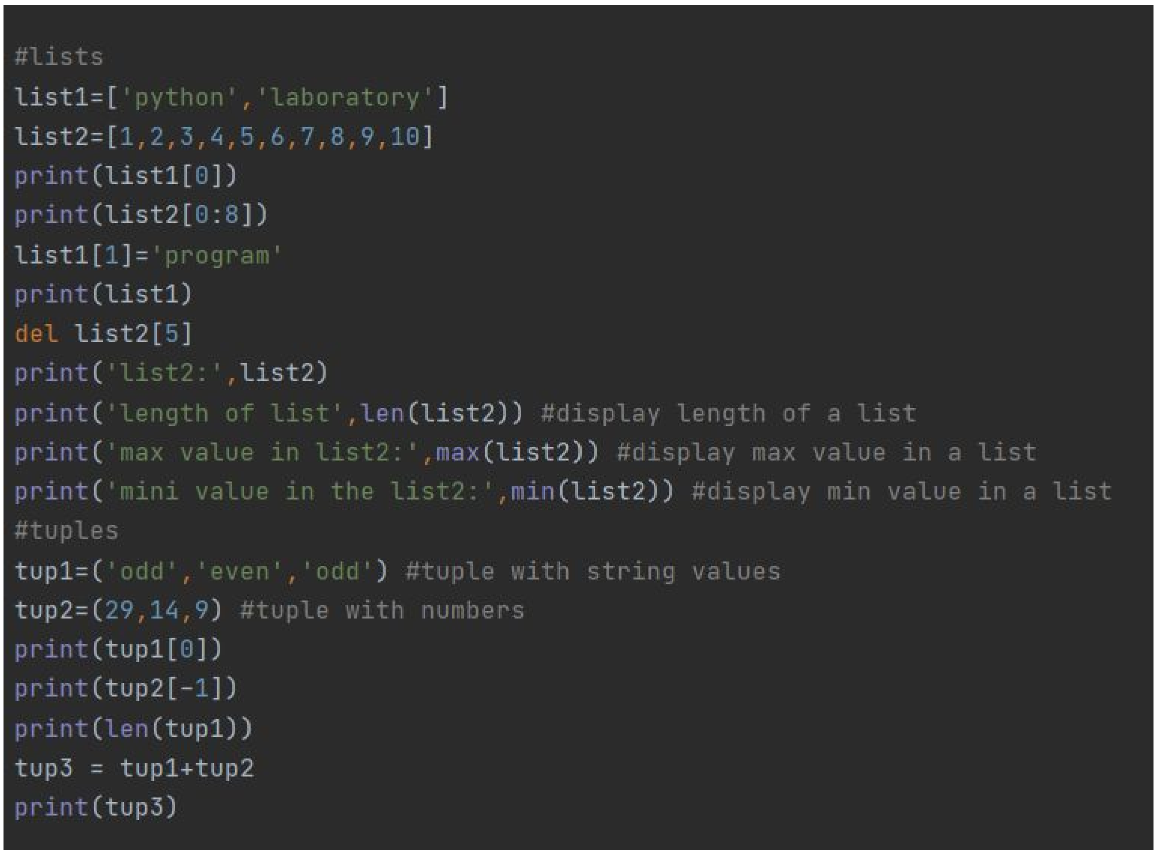
**Output:**



```
Enter a string:thor
Enter another string:ragnarok
thorragnarok
THOR
thor
t
r
or
4
['thor']
-1
thor
Thor
1
```

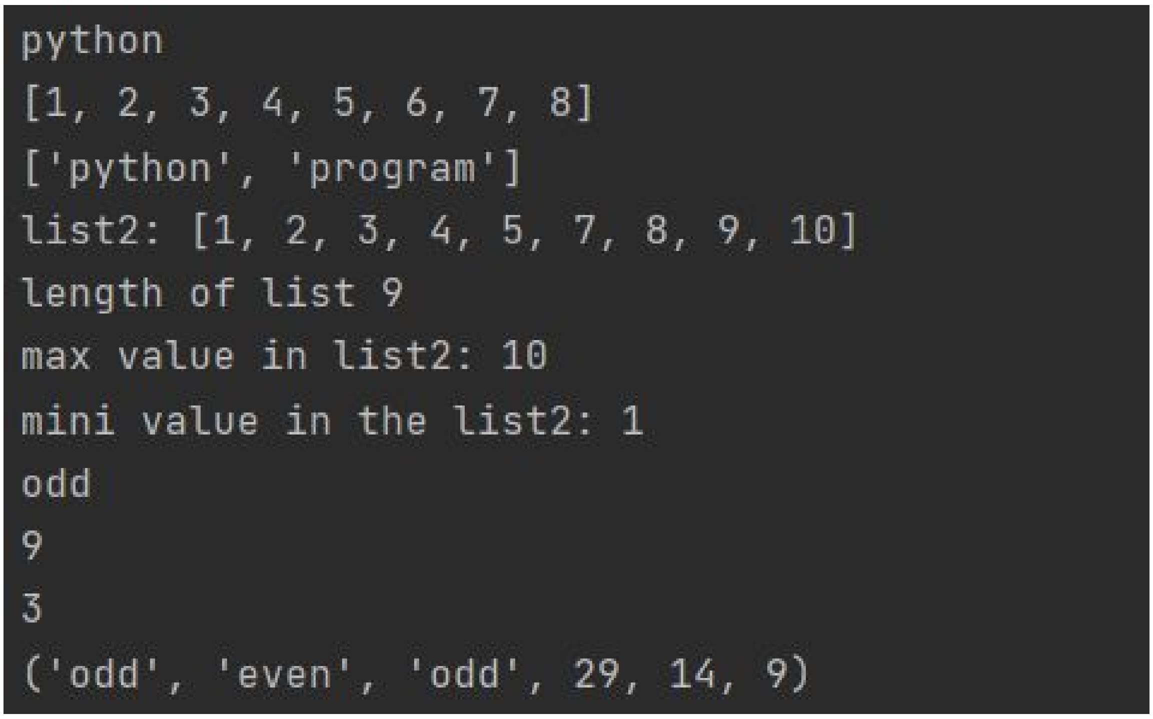
**Q iii.**

**Program:**



```python
#lists
list1=['python','laboratory']
list2=[1,2,3,4,5,6,7,8,9,10]
print(list1[0])
print(list2[0:8])
list1[1]='program'
print(list1)
del list2[5]
print('list2:',list2)
print('length of list',len(list2)) #display length of a list
print('max value in list2:',max(list2)) #display max value in a list
print('mini value in the list2:',min(list2)) #display min value in a list
#tuples
tup1=('odd','even','odd') #tuple with string values
tup2=(29,14,9) #tuple with numbers
print(tup1[0])
print(tup2[-1])
print(len(tup1))
tup3 = tup1+tup2
print(tup3)
```

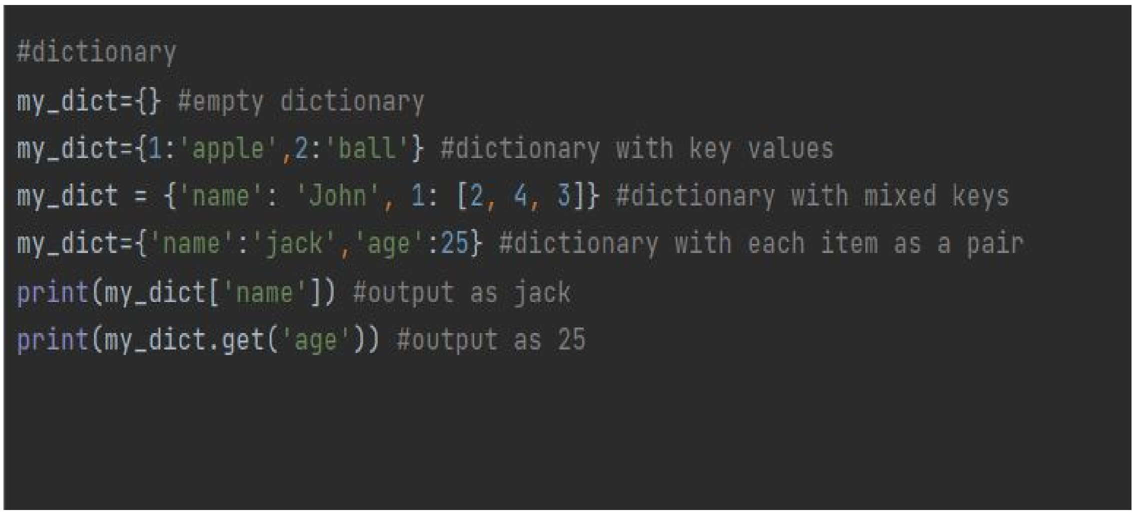
**Output:**



```
python
[1, 2, 3, 4, 5, 6, 7, 8]
['python', 'program']
list2: [1, 2, 3, 4, 5, 7, 8, 9, 10]
length of list 9
max value in list2: 10
mini value in the list2: 1
odd
9
3
('odd', 'even', 'odd', 29, 14, 9)
```

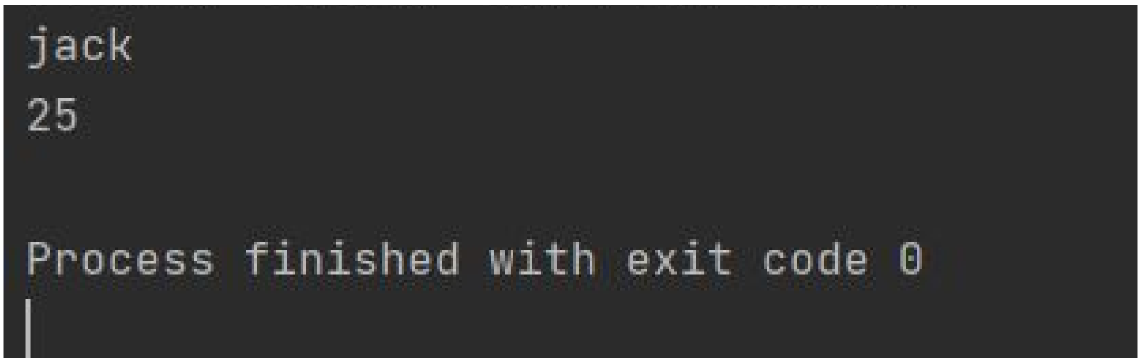
**Qiv.**

**Program:**



```
#dictionary
my_dict={} #empty dictionary
my_dict={1:'apple',2:'ball'} #dictionary with key values
my_dict = {'name': 'John', 1: [2, 4, 3]} #dictionary with mixed keys
my_dict={'name':'jack','age':25} #dictionary with each item as a pair
print(my_dict['name']) #output as jack
print(my_dict.get('age')) #output as 25
```

**Output:**

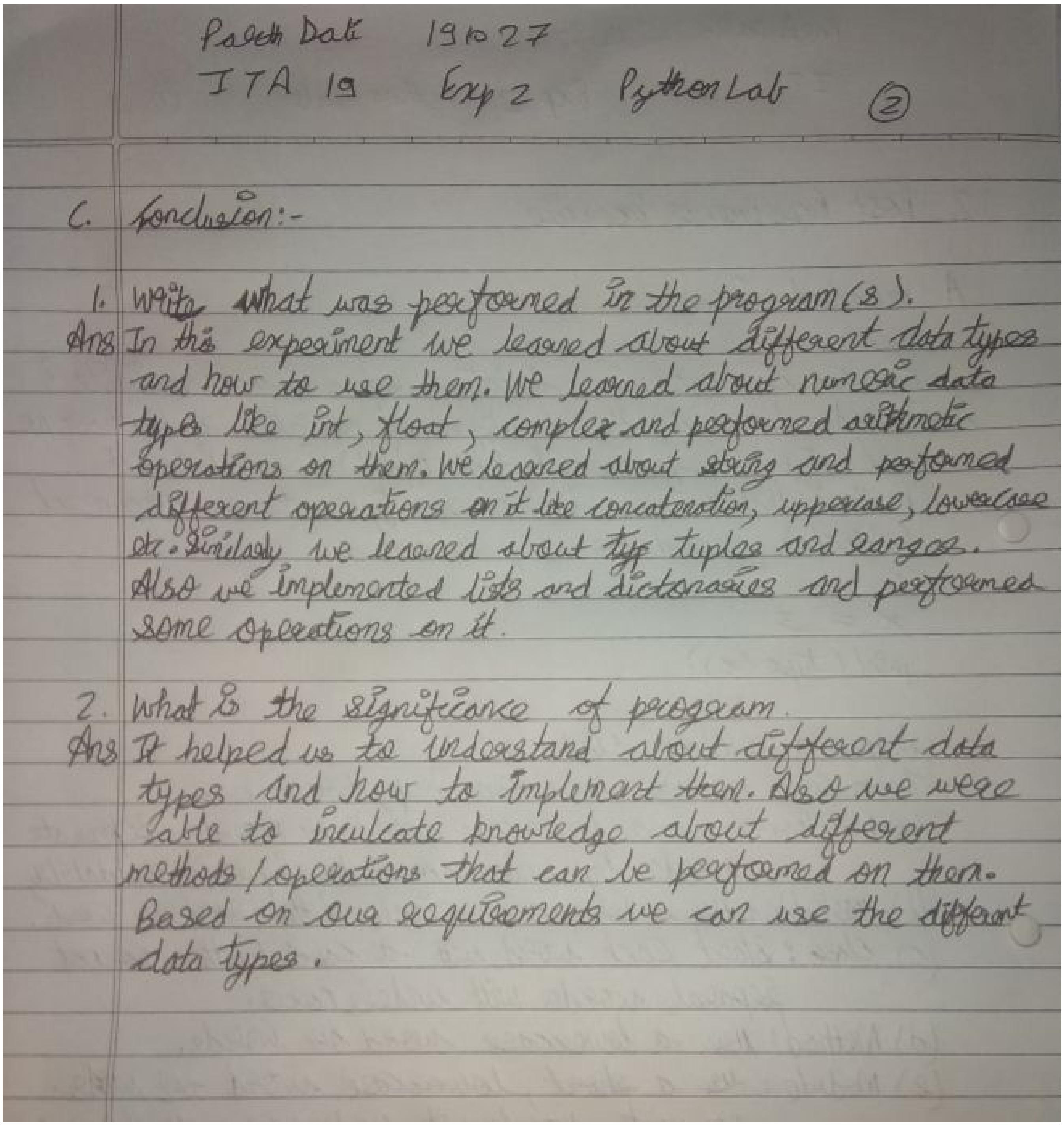


```
jack
25

Process finished with exit code 0
```

**C. Conclusion:**

1. Write what was performed in the program (s).
2. What is the significance of program (s)?



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C. Conclusion:-

1. Write what was performed in the program(s).

Ans In this experiment we learned about different data types and how to use them. We learned about numeric data types like int, float, complex and performed arithmetic operations on them. We learned about string and performed different operations on it like concatenation, uppercase, lowercase etc. Similarly we learned about ~~typ~~ tuples and ranges. Also we implemented lists and dictionaries and performed some operations on it.

2. What is the significance of program.

Ans It helped us to understand about different data types and how to implement them. Also we were able to inculcate knowledge about different methods / operations that can be performed on them. Based on our requirements we can use the different data types.

**D. References**

[1] Dr. R. Nageswara Rao,” Core Python Programming” , Dreamtech Press, Wiley Publication

[2] https://www.pythonforbeginners.com