Ex. 4

EXPLORING LOOPS

Date: 12 Feb 2024

Aim:

To explore the use of loops in Python by writing programs for the following and executing them:

a. Print the list of prime numbers between 1 and N.
b. Print the multiplication table up to M for a number N.
c. Print the following pattern for 2N-1 rows.

```
          1
      2       2
  3       3       3
      2       2
          1
```

d. Find the greatest common divisor of 2 numbers obtained from the user.
e. Find the sum of the series $1, -(1^2), 2^3, -(3^4), 5^5, -(8^6), 13^7, \ldots$ up to N terms.
f. Find the sum of the digits of a given integer, N.
g. Find the square root of an integer, N, using Newton's method. Obtain N and the limit, L, from the user.

Algorithm:

(a)

Step – 1 : Get the value of N form the user

Step – 2 : Iterate through each number between 1 and N and Check if it’s prime by iterrative modulas division by all the numbers between 2 and the number / 2 until a divisor is found then it is not prime.

Step – 3 : Print the Numbers that are not

(b)

Step – 1: Get the Inputs of N and M

Step – 2 : In a for loop of range 1 to N+1 print NxM

Step – 3 : Print the multiplicatives in a standard Tables format (M x N = {M*N})

(c)

Step – 1 : Get the input of N (the maximum number in pattern) from the user.

Step – 2 : With 2 for loops. With one for top half and the other for lower half, print the required spaces and print the row number,row number of times.

Step – 3 : The lower half starts form 1 – the end and lowers till it reaches 1 as row number.

(d)

Step – 1 : Get two numbers from the user

Step – 2 : Divide the larger number by the numbers between the smaller number and 1.

Step – 3 : Untill you reach a divisible number that is divisible by both the larger and smaller number print the Greatect common divisor.

(e)

Step – 1 : Obtain the number of terms from the user.

Step – 2 : Create a list of fibonacci series for the number of terms

Step – 3 : Add the elements by multiplying the element to the power of th term number and to the -1 if it is a even term.

(f)

Step – 1 : Get the Number form the user

Step – 2: Conver the number into a string and iterate throught it while converting each character into a integer and adding it to a common variable 'sum'.

Step – 3 : Print the sum to the user.

(g)

Step – 1 : Get the number as input from the user.

Step – 2 : Assign X to be N, In a while loop assign root to be = 0.5 * (X + (N/X)) and exit the while loop if the difference between X and root is less than the Tolerance level if not then assign X the value of root.

Step – 3 : Print the the value of root to the user.

Program:

(a)

```
# Printing list of prime numbers Between 1 and N

for i in range(2,int(input("Enter N : "))+1):
    f=0
    for j in range(2,(i//2)+1):
        if(i%j == 0):
            f = 1
            break
    if(f==0):
        print(i,end = ", ")
```

(b)

```
# Multiplication Table

N = int(input("Enter the Starting Integer : "))
for j in range(1,int(input("Enter the number of Multiplicatives Needed : "))+1):
    print(N," x ", j , " = ", N*j)
```

(c)

```
# Print Diamond Pattern

N = int(input("Enter the maximum number in the pattern : "))
for i in range(1,N+1):
    print("  "*(N-i),(str(i)+'   ')*i)
for i in range(N-1,0,-1):
    print("  "*(N-i),(str(i)+'   ')*i)
```

(d)

```
# Greatest Common Divisor of two numbers

M = int(input("Enter Number - 1 : "))
n = int(input("Enter Number - 2 : "))
if(n>M):
    n,M = M,n
for i in range(n,0,-1):
    if (M%i==0 and n%i==0):
        print("Greatest Common Divisor is : ",i)
        break
```

(e)

```
# Find the sum of series

sum = 0
N = int(input("Enter the number of terms in Series : "))
F_Series = [1,1]
for i in range(2,N):
    F_Series.append(F_Series[i-1] + F_Series[i-2])
for i in range(N):
    sum+= ((-1)**i) * (F_Series[i]**(i+1))
print("Sum of Series = ",sum)
```

(f)

```
# Sum Of digits of given Number

sum = 0
for i in [int(x) for x in input("Enter the number : ")]:
    sum+=i
print(sum)
```

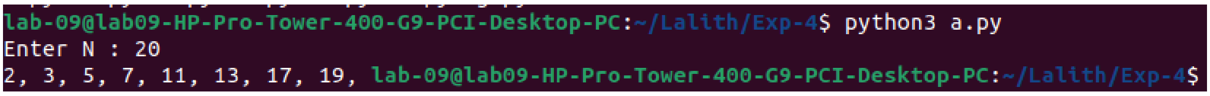
(g)

```
# Newton Method for finding Root

N = int(input("Enter the number to find root of : "))
l = float(input('Enter the tolerance level : '))
X = N
while(True):
    root = 0.5 * (X + (N/X))
    if(root - X<0):
        if(X-root< l):
            break
    else:
        if(root-X<l):
            break
    X = root
print(root)
```

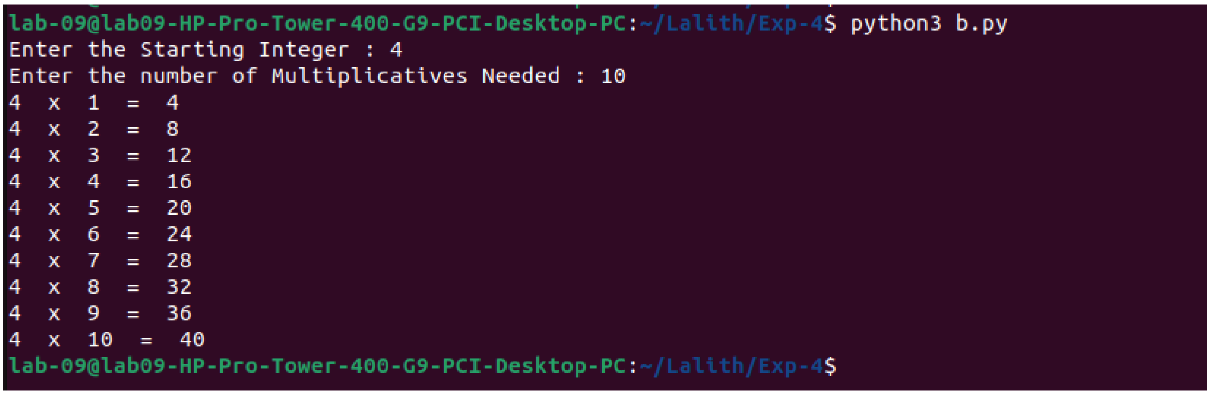
Screenshot of Output:

(a)



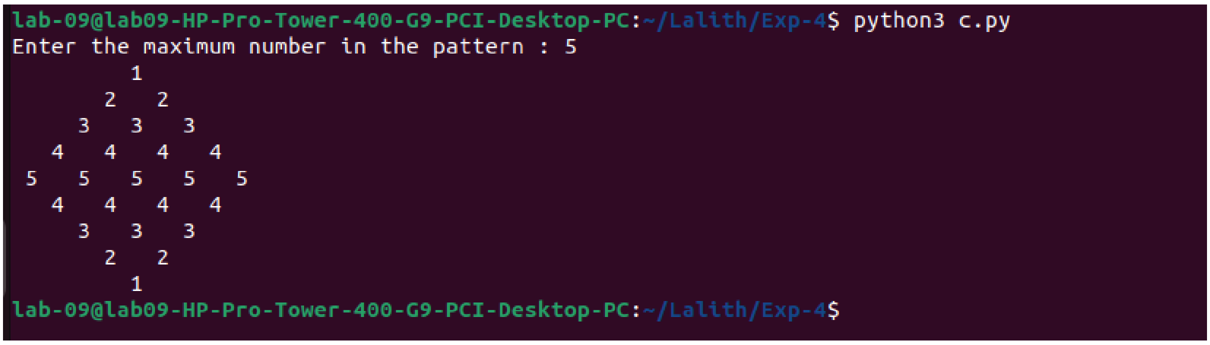
```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 a.py
Enter N : 20
2, 3, 5, 7, 11, 13, 17, 19, lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

(b)



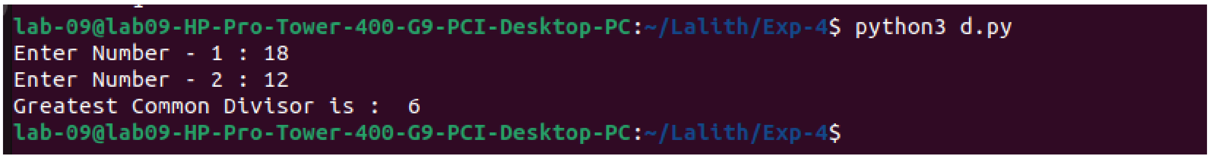
```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 b.py
Enter the Starting Integer : 4
Enter the number of Multiplicatives Needed : 10
4  x  1  =  4
4  x  2  =  8
4  x  3  =  12
4  x  4  =  16
4  x  5  =  20
4  x  6  =  24
4  x  7  =  28
4  x  8  =  32
4  x  9  =  36
4  x  10  =  40
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

(c)



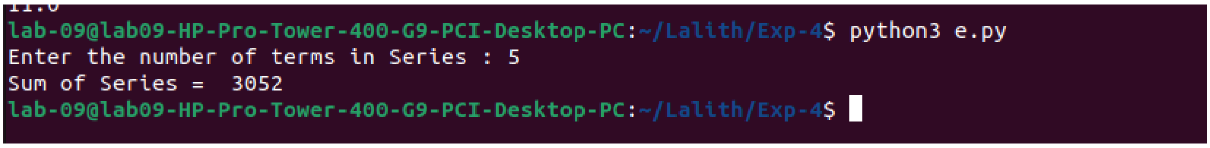
```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 c.py
Enter the maximum number in the pattern : 5
         1
       2   2
     3   3   3
   4   4   4   4
 5   5   5   5   5
   4   4   4   4
     3   3   3
       2   2
         1
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

(d)



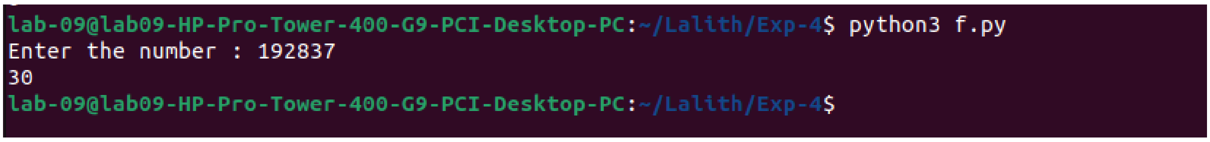
```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 d.py
Enter Number - 1 : 18
Enter Number - 2 : 12
Greatest Common Divisor is :  6
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

(e)



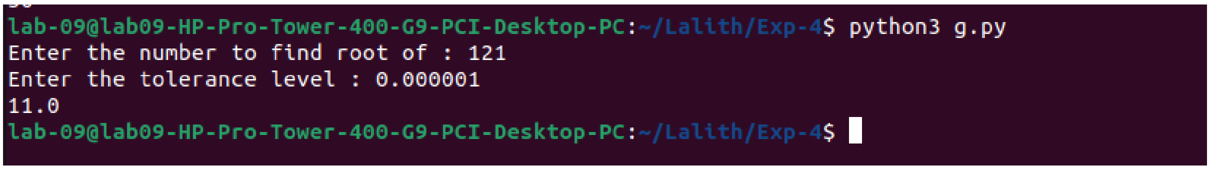
```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 e.py
Enter the number of terms in Series : 5
Sum of Series =  3052
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

(f)



```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 f.py
Enter the number : 192837
30
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

(g)



```
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$ python3 g.py
Enter the number to find root of : 121
Enter the tolerance level : 0.000001
11.0
lab-09@lab09-HP-Pro-Tower-400-G9-PCI-Desktop-PC:~/Lalith/Exp-4$
```

Result:

Thus, programs have been written and executed to explore the use of loops in Python.