

providing documentation in a Python program. In Python, it is similar to comment but the docstring is considered as a string constant and it describes the functionality of the function. Docstrings consist of the following features.

- It begins and ends with """
- The first letter should be an upper case letter.
- The docstring should end with """
- If the docstring contains multiple lines then the second line should be left blank.
- The \_\_doc\_\_ is used to access the docstring value.

#### Example 4

```
def fun1():
    """This is docstring line1."""
    pass
print(fun1.__doc__)
```

#### Output

```
D:\PythonPrograms\aa>python a2.py
This is docstring line1.
```

#### Example 5

```
def fun1():
    """This is docstring line1.
    This is second line. """
    pass
print(fun1.__doc__)
```

#### Output

```
D:\PythonPrograms\aa>python a2.py
This is docstring line1.
This is second line.
```

## 8.15 Sample Programs

**Program 1:** Write a Python program to print the statement “Sample Program” for n times.

```
def f1():
    print("Sample Program")
n=int(input("Enter the value of n: "))
for i in range(n):
    f1()
```



#### Programming Tip:

With the functions, the code can be efficiently organized

#### Output

```
D:\PythonPrograms>python a1.py
Enter the value of n: 5
Sample Program
Sample Program
Sample Program
Sample Program
Sample Program
```

**program 2:** Write a Python program to define a function within a function.

```
x=1
def f1():
    x=2
    def inner():
        print(x)
    inner()
f1()
```

#### Output

```
D:\PythonPrograms>python a1.py
2
```

**program 3:** Write a Python program to print the multiplication table of a given number by using user-defined function.

```
def multable(x):
    for i in range(1,11):
        print(i,"*",x,"=",i*x)
x=int(input("Enter the value of n: "))
multable(x)
```

#### Output

```
D:\PythonPrograms>python a1.py
Enter the value of n: 12
1 * 12 = 12
2 * 12 = 24
3 * 12 = 36
4 * 12 = 48
5 * 12 = 60
6 * 12 = 72
7 * 12 = 84
8 * 12 = 96
9 * 12 = 108
10 * 12 = 120
```

**program 4:** Write a Python program to develop call by value.

```
def inr(x):
    x=x+1
    print("x value in inr(): ",x)
n=int(input("Enter the number:"))
print("original value of n: ",n)
inr(n)
print("After function call, value of n: ",n)
```

#### Output

```
D:\PythonPrograms>python a1.py
Enter the number:5
original value of n: 5
x value in inr(): 6
After function call, value of n: 5
```

**program 5:** Write a Python program to develop call by reference.

```
def inr(x):
    x[0]=x[0]+1
    print("x value in inr(): ",x[0])
n=[]
n1=int(input("Enter the number:"))
n.append(n1)
print("Original value of n: ",n[0])
inr(n)
print("After function call, value of n: ",n[0])
```

#### Output

```
D:\PythonPrograms>python a1.py
Enter the number:100
Original value of n: 100
x value in inr(): 101
After function call, value of n: 101
```

**Program 6:** Write a Python program to swap two numbers by using user-defined functions.

```
def swap(x,y):
    temp=x
    x=y
    y=temp
    return (x,y)
n1=input("Enter the number:")
n2=input("Enter the number:")
print("The two input values: ",n1,n2)
(n1,n2)=swap(n1,n2)
print("The swapped x value: ",n1)
print("The swapped y value: ",n2)
```

**Output**

```
D:\PythonPrograms>python a1.py
Enter the number: a
Enter the number :b
The two input values: a b
The swapped x value: b
The swapped y value: a
```

**Program 7:** Write a Python program to find the sum of the series  $1!/1+2!/2+3!/3+4!/4+5!/5$ .

```
def f(x):
    s=1
    for i in range(1,x+1):
        s=(s*i)
    return(s)
a=int(input("Enter the number:"))
res=0
for j in range(1,a+1):
    res=res+(f(j)/j)
print("The final result= ",res)
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the number:6
The final result= 154.0
```

**Program 8:** Write a Python program to print all natural numbers between 1 to n using functions.

```
def f(x1,y1):
    for i in range(x1,y1+1):
        print(i)
x=int(input("Enter the lower limit:"))
y=int(input("Enter the upper limit:"))
f(x,y)
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the lower limit:4
Enter the upper limit:15
4
5
6
7
8
9
10
11
12
13
14
15
```

**Program 9:** Write a Python program to print all even or odd numbers in given range using functions.

```
def f(x1,y1):
    e=[]
    l=[]
    for i in range(x1,y1+1):
        if((i%2)==0):
            e.append(i)
        else:
            l.append(i)
    print("Even numbers: ",e)
    print("Odd numbers: ",l)
x=int(input("Enter the lower limit:"))
y=int(input("Enter the upper limit:"))
f(x,y)
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the lower limit:2
Enter the upper limit:10
Even numbers: [2, 4, 6, 8, 10]
Odd numbers: [3, 5, 7, 9]
```

**Program 10:** Write a Python program to find sum of elements of array using functions.

```
def su(a):
    l=len(a)
    s=0
    for i in range(0,l):
        s=s+a[i]
    return(s)
l=[10,20,30]
r=su(l)
print("result=",r)
```

**Output**

```
D:\PythonPrograms>python b2.py
result= 60
```

**Program 11:** Write a Python program to find maximum and minimum elements in array using functions.

```
def su(a):
    l=len(a)
    mi=a[0]
    mx=a[0]
    for i in range(1,l):
        if(a[i]>mx):
            mx=a[i]
        if(a[i]<mi):
            mi=a[i]
    print("Max element=",mx)
    print("Min element=",mi)
l=[10,20,30,50,5,90,32]
print("Input=",l)
su(l)
```

**Output**

```
D:\PythonPrograms>python b2.py
Input= [10, 20, 30, 50, 5, 90, 32]
Max element= 90
Min element= 5
```

**Program 12:** Write a Python program to find sum of all natural numbers between 1 to n using recursion.

```
def su(a,b):
    if(a==b):
        return(b)
    else:
        return a+su(a+1,b)
x=int(input("Enter the n value:"))
s=su(1,x)
print("The sum=",s)
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the n value:5
The sum= 15
```

**Program 13:** Write a Python program to find sum of all even numbers in given range using recursion.

```
def su(a,b):
    if(a>b):
        return(0)
    else:
        return a+su(a+2,b)
x=int(input("Enter the n value:"))
s=su(2,x)
print("The sum=",s)
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the n value:10
The sum= 30
```

**Program 14:** Write a Python program to find reverse of any number using function.

```
def r(x):
    res=0
    while(x>0):
        y=x%10
        res=(res*10)+y
        x=x//10
    return(res)
a=int(input("Enter the number:"))
print("Original Number: ",a)
print("Reverse Number : ",r(a))
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the number: 789
Original Number: 789
Reverse Number : 987
```

**Program 15:** Write a Python program to check whether a number is palindrome or not using function.

```
def r(x):
    res=0
    while(x>0):
        y=x%10
        res=(res*10)+y
        x=x//10
    return(res)
a=int(input("Enter the number:"))
print("Original Number: ",a)
b=r(a)
if(a==b):
    print("The given number is a palindrome")
else:
    print("The given number is not a palindrome")
```

**Output**

```
D:\PythonPrograms>python b2.py
Enter the number:989
Original Number: 989
The given number is a palindrome
```

**program 16:** Write a Python program to find sum of digits of a given number using recursion.

```
def s(x):
    if(x==0):
        return(0)
    else:
        return((x%10)+(s(x//10)))
a=int(input("Enter the number:"))
print("original number= ",a)
print("Sum of digits= ",s(a))
```

### Output

```
D:\PythonPrograms>python b2.py
Enter the number:456
original number= 456
Sum of digits= 15
```

**program 17:** Write a Python program to generate the nth Fibonacci term using recursion.

```
def s(x):
    if(x==0):
        return(0)
    elif(x==1):
        return(1)
    else:
        return(s(x-1)+s(x-2))
a=int(input("Enter the number:"))
print(a, "th fibonacci term is= ",s(a))
```

### Output

```
D:\PythonPrograms>python b2.py
Enter the number:10
10 th fibonacci term is= 55
```

## 8.16 Case Studies

### 8.16.1 Recursive Binary Search

```
def bs(a, i, n, s):
    if n >= i:
        m = int((i+n)//2)
        if a[m]==s:
            return m
        elif a[m]>s:
            return bs(a, i, m-1, s)
        else:
            return bs(a, m+1, n, s)
    else:
        return(-1)

a=[]
n=int(input("Enter number of elements:"))
for i in range(0,n):
    b=int(input("Enter the element:"))
    a.append(b)
s=int(input("Enter the element to be searched:"))
re = bs(a,0,n-1,s)
if re>-1:
    print("The element is found at",re,"position")
else:
    print("The element is not found")
```

### Output

```
D:\PythonPrograms>python b2.py
Enter number of elements:5
Enter the element:10
Enter the element:20
Enter the element:30
Enter the element:40
Enter the element:50
Enter the element to be searched:50
The element is found at 4 position
```