

Data Science & Artificial Intelligence



Python For Data Science

Lecture No.- 06



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Recap of Previous Lecture



- Tuples

- Sets

- Dictionaries



Topics to be Covered



- Functions

- Recursion

SUPER 1500+ - CLASS - 5 - Homework Question - 1

#Q. Output Printed by below Code is 38

Set1={1,2,4,6,8,10}

Set2={1,2,3,4,5,6}

Set3={1,3,5,6,7,9,1,5} = {1,3,5,6,7,9}

s1=Set1 & Set2 s1={1,2,4,6}

s2=Set2 | Set3 s2={1,2,3,4,5,6,7,9}

x=len(Set3) x=6 j=1,2,3,4,5,6,7,9

for i in s1: i=1 x=6+8=14

 for j in s2: i=2 x=14+8=22

 x=x+1 i=4 x=22+8=30

print(x) i=6 x=30+8=38

SUPER 1500+ - CLASS - 5 - Homework Question - 2



#Q. The number of times print statement is executed is _____

$s1 = \{5, 7, 9, 7, 5\}$ $s1 = \{5, 7, 9\}$

$s2 = \{3, 5, 7, 5, 3\}$ $s2 = \{3, 5, 7\}$

$s3 = \{1, 2, 3, 4, 5\}$

$s1 \cdot \text{intersection}(s3) = \{5\}$

$s3 \cdot \text{Symmetric_difference}(s2) = \{1, 2, 4, 7\}$

for i in range(len(s1.intersection(s3))): # 1

for j in range(len(s3.symmetric_difference(s2))): # 4

print("Hi") # 4 times

SUPER 1500+ - CLASS - 5 - Homework Question - 3



#Q. What is printed by below code?

a={'apple','banana','mango'}

b={'mango','grapes','chiku'}

c={'chiku','banana','guava'}

x=len(a&b) x = 1

y=len(b^c) y = 4

z=len(c-a) z = 2

print(x+y+z) ~~7~~

$a \cap b = \{\text{'mango'}\}$

$b \cap c = \{\text{'mango'}, \text{'grapes'}, \text{'banana'}, \text{'guava'}\}$

$c - a = \{\text{'chiku'}, \text{'guava'}\}$

SUPER 1500+ - CLASS – 5 - Homework Question - 4

#Q. The output of below code will be _____

```
i=[10,20,30,40,50]  
j=(60,70,80)  
for i,j in zip(i,j):  
    print(i,',',j,end=',')
```

- A) 10,20,30,40,50,60,70,80
- B) 10,20,30,60,70,80
- C) [10,20,30],[60,70,80]
- ☒ D) 10,60,20,70,30,80

SUPER 1500+ - CLASS - 5 - Homework Question - 5

#Q. The output of below Python Code Segment is _____

```
from collections import OrderedDict
```

```
d = OrderedDict()
```

```
d['p'] = 10
```

```
d['q'] = 12
```

```
d['r'] = 23
```

```
d['s'] = 34
```

```
d.pop('r')
```

```
d.pop('p')
```

```
d['r'] = 20
```

```
d['t'] = 55
```

```
d.pop('q')
```

```
d['p'] = 15
```

```
for key, value in d.items():
```

```
    print(key, value, end=' ')
```

| | | | | | | |
|-------------------|-------------------|-------------------|--------|--------|--------|--------|
| 'p':10 | 'q':12 | 'r':23 | 's':34 | 'r':20 | 't':55 | 'p':15 |
|-------------------|-------------------|-------------------|--------|--------|--------|--------|

A. p 15 r 20 s 34 t 55

B. t 55 s 34 r 20 p 15

C. s 34 r 23 t 55 p 15

☒ D. s 34 r 20 t 55 p 15

#Q. The return value of below function $f(5)$ is _____?

```
def f(n):
    if n <= 0:
        return n
    elif n >= 3:
        return n + f(n - 3)
    else:
        return n + f(n + 2)
```

$$f(5) \quad n=5$$

$$5 + f(2) \quad n=2$$

$$2 + f(4) \quad n=4$$

$$4 + f(1) \quad n=1$$

$$1 + f(3) \quad n=3$$

$$\frac{3 + f(0)}{0}$$

$$5 + 2 + 4 + 1 + 3 + 0$$

$$= 15$$

#Q. The value returned by fun(3,9) is _____?

```
def fun(a,b):
    if (a==b) or (a<0) or (b<0):
        return a+b
    elif a>b:
        return a+fun(a-1,b+1)
    else:
        return b+fun(a+1,b-1)
```

A) 25

B) 28

C) 30

☒ D) 36

$$\begin{aligned}
 & \text{fun}(3, 9) \\
 & 9 + \text{fun}(4, 8) \\
 & 8 + \text{fun}(5, 7) \\
 & 7 + \text{fun}(6, 6) \\
 & \quad \quad \quad 12 \\
 & 9 + 8 + 7 + 12 \\
 & \quad \quad \quad = \underline{\underline{36}}
 \end{aligned}$$

#Q. The output printed by below code segment will be _____

```
def f(x):
    if x<=1:
        print(x-1)
    elif x<=3:
        print(x+1,end=' ')
        f(x-1)
    else:
        f(x-2)
        print(x,end=' ')
```

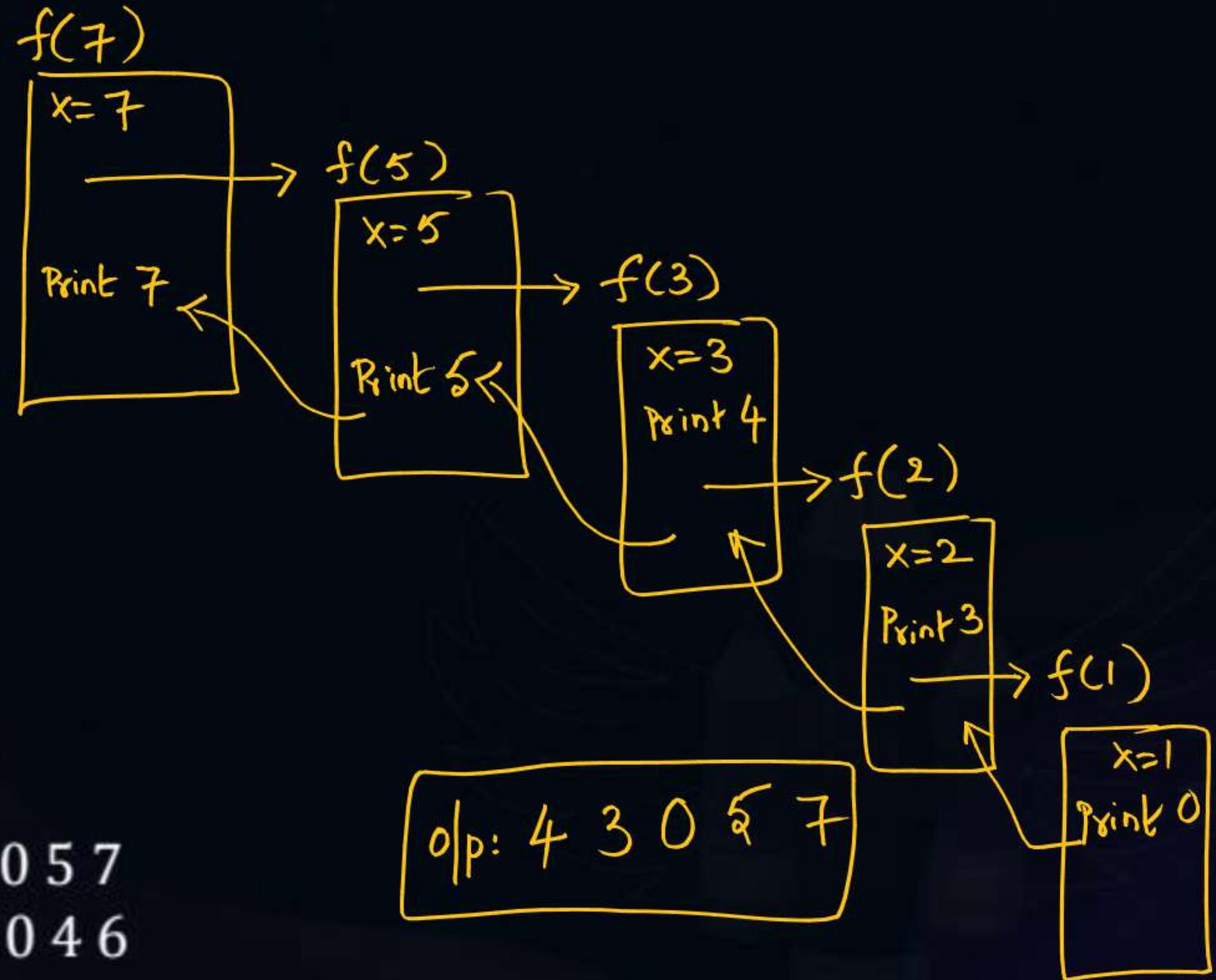
f(7)

A) 2 1 2 5 7

B) 2 1 1 5 7

☒ C) 4 3 0 5 7

D) 4 3 0 4 6



#Q. What will be the output?

```
def f(x):
    if x <= 1:
        return x
    elif x >= 3:
        return x + f(x-1) + f(x-2)
    else:
        return x + f(x-1) + f(x-3)
print(f(6))
```

Ans: 41

$f(1)$ return 1

$f(x)$ return x when $x \leq 0$

$$f(-1) = -1$$

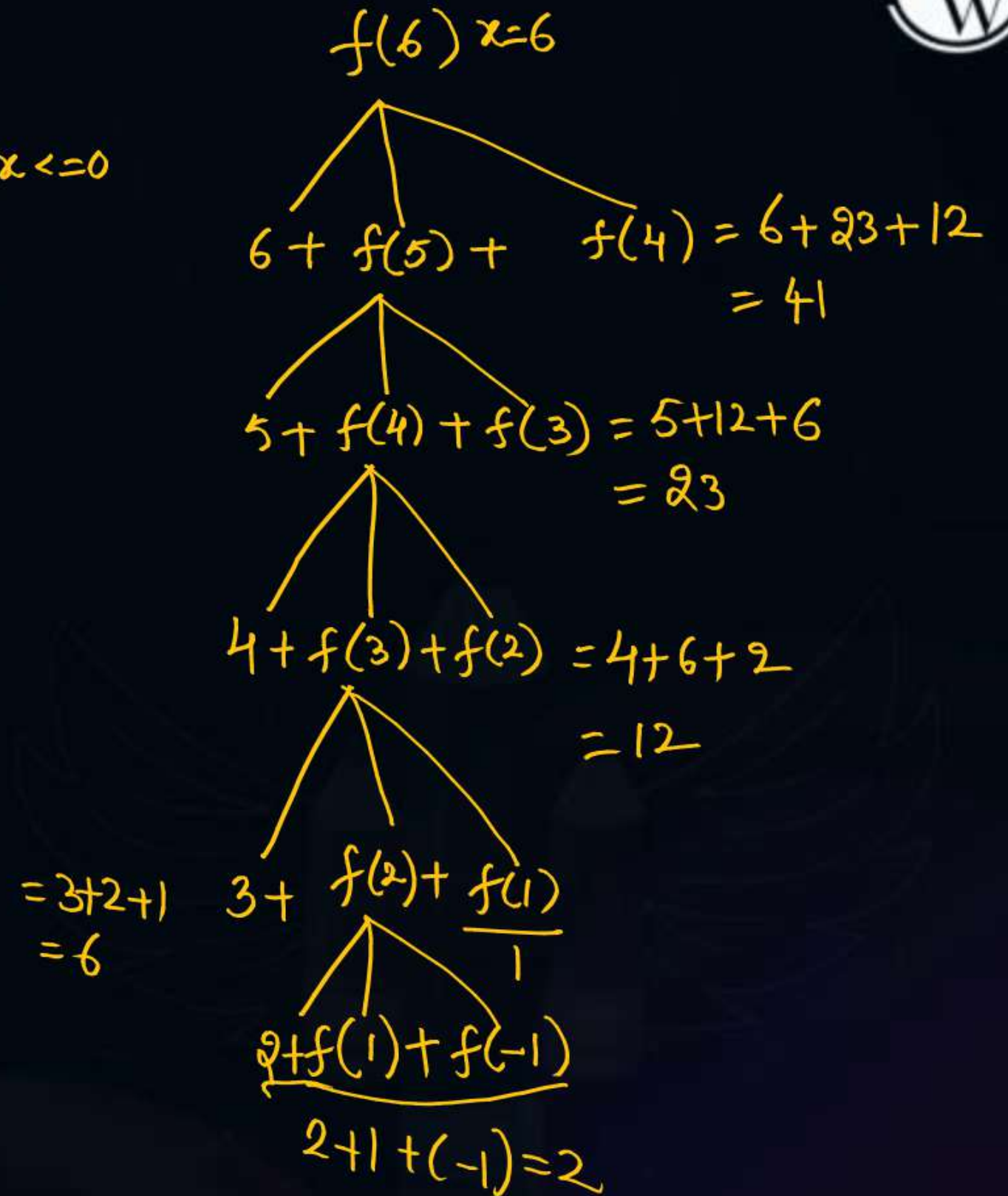
$$f(2) = 2$$

$$f(3) = 6$$

$$f(4) = 12$$

$$f(5) = 23$$

$$f(6) = 41$$




#Q. The output printed will be 12?



```
def f1(x):
    if x<=1:
        return x
    return f1(x-1)+f2(x)+f3(x)
```

```
def f2(x):  
    count=0  
    if x<0:  
        return x+1  
    for i in range(x):  
        count+=1  
        f2(x-1)  
    return count
```



$f_3(3)$
 $i=0$ $count=1$ $f_3(2) \rightarrow f_3(1)$
 $i=1$ $count=2 \rightarrow f_3(2)$ $f_3(1) \rightarrow f_3(0)$
 $i=2$ $count=2+2=4$

```

def f3(x):
    count=1
    if x<=0:
        return x-1
    for i in range(x):
        count+=i
    f3(x-1)
    return count
    
```

$i=0$ $1+0=1$
 $i=1$ $1+1=2$

```
print(f1(3))
```

$$5 + 3 + 4 = \underline{\underline{12}}$$
$$f_1(2) + f_2(3) + f_3(3)$$
$$f_2(3)$$
$$\lambda = 0, 1, 2$$

i=0 Count=1
i=1 —

$$f_2(2)$$

$i=0$ Count=1 $f_2(1)$
 $i=1$ Count=2 $f_2(1)$

 $f_2(1)$

$\hookrightarrow \text{count} = 1, f_2(0) \text{ count} = 0$

Count = 2 $f_2(x)$

$i=2$ count=3 $f_2(2) \rightarrow f_2(1) \rightarrow f_2(0)$

$$= 5 \quad \begin{array}{c|c|c} f_1(1) & f_2(2) & f_3(2) \\ \hline 2 & 2 & 2 \end{array}$$
$$1+2+2$$

2

2

#Q. The total number of recursive calls made by fact() function is ____?

(NOTE: Initial call is not a recursive call)

```
def fact(x):
```

```
    if x==0:
```

```
        print(x)
```

```
    elif x<0:
```

```
        print(x-x)
```

```
    else:
```

```
        fact(x-1)
```

```
        print(x+1)
```

```
        fact(x-2)
```

fact(5)

A) 15

B) 23

C) 24

D) 25

$$25 - 1 = 24$$



#Q. The return value of function(1) will be 42

```
def function(i):
```

```
    if i >= 10:
```

```
        return i+1
```

```
    else:
```

```
        return i+function(function(i+2))
```

$f(1)$

$1 + f(f(3))$

40

$1 + f(40)$

$1 + 41$

$= 42$

$f(3)$

$3 + f(f(5))$

$3 + f(36)$

$3 + 37$

$= 40$

$f(5)$

$5 + f(f(7))$

$5 + f(30)$

$5 + 31$

$= 36$

$f(7)$

$7 + f(f(9))$

$f(22)$

$7 + 23$

$= 30$

$f(9)$

$9 + f(f(11))$

$9 + f(12)$

$9 + 13$

$= 22$

$f(11)$

12

#Q. The rvalue returned by below code segment is 25

```
def f(x):
    if not x:
        return x+1
    else:
        return x<<1 + x>>1
rvalue=1
for i in range(4):
    rvalue+=f(i+1)
```

$$\begin{aligned} i=0 & \quad \gamma = 1 + f(1) \\ & \quad = 1 + 2 = 3 \end{aligned}$$

$$\begin{aligned} i=1 & \quad \gamma = 3 + f(2) \\ & \quad = 3 + 5 = 8 \end{aligned}$$

$$\begin{aligned} i=2 & \quad \gamma = 8 + f(3) \\ & \quad = 8 + 7 = 15 \end{aligned}$$

$$\begin{aligned} i=3 & \quad \gamma = 15 + f(4) \\ & \quad = 15 + 10 \\ & \quad = \underline{25} \end{aligned}$$

$$\begin{aligned} f(1) &= 1 \ll 1 + 1 \gg 1 \\ &= 1 * 2^1 + 1 // 2^1 \\ &= 2 + 0 \\ &= 2 \end{aligned}$$

$$\begin{aligned} f(2) &= 2 \ll 1 + 2 \gg 1 \\ &= 2 \times 2 + 2 // 2 \\ &= 4 + 1 \\ &= 5 \end{aligned}$$

$$\begin{aligned} f(3) &= 3 \times 2 + 3 // 2 \\ &= 6 + 1 \\ &= 7 \end{aligned}$$

$$\begin{aligned} f(4) &= 4 \times 2 + 4 // 2 \\ &= 8 + 2 \\ &= 10 \end{aligned}$$

#Q. The return value of below function fun(7,3,15) is 45

```
def fun(x,y,z):
    if x==y or y==z or x==z:
        return x-y+z
    elif x>y:
        return x+fun(x-1,y,z+2)
    elif y>z:
        return y+fun(x+1,y-1,z)
    else:
        return z+fun(x,y,z-1)
```

$$7 + \text{fun}(6, 3, 17)$$

$$6 + \text{fun}(5, 3, 19)$$

$$5 + \text{fun}(4, 3, 21)$$

$$4 + \text{fun}(3, 3, 23)$$

$$3 - 3 + 23$$

$$= 23$$

$$7 + 6 + 5 + 4 + 23$$

$$= \underline{45}$$

#Q. The output would be 15

```
def fun(n):
    x = 1
    if n == 1:
        return x
    for k in range(1, n):
        x += fun(k) * fun(n - k)
    return x
print(fun(4))
```

$$\text{fun}(1) = 1$$

$$\begin{aligned} \text{fun}(2) & \quad k=1 \quad x = 1 + \text{fun}(1) * \text{fun}(1) \\ & \quad \quad \quad = 1 + 1 * 1 = 2 \end{aligned}$$

$$\begin{aligned} \frac{\text{fun}(3)}{3} & \quad k=1 \quad x = 1 + \text{fun}(1) * \text{fun}(2) = 1 + 1 * 2 = 3 \\ & \quad k=2 \quad x = 3 + \text{fun}(2) * \text{fun}(1) = 3 + 2 * 1 = 5 \end{aligned}$$

$$\begin{aligned} \text{fun}(4) & \quad k=1 \quad x = 1 + \text{fun}(1) * \text{fun}(3) = 1 + 1 * 5 = 6 \\ & \quad k=2 \quad x = 6 + \text{fun}(2) * \text{fun}(2) = 6 + 2 * 2 = 10 \\ & \quad k=3 \quad x = 10 + \text{fun}(3) * \text{fun}(1) = 10 + 5 * 1 \\ & \quad \quad \quad = 15 \end{aligned}$$

SUPER 1500+ - CLASS – 5 - Homework Question - 1

#Q. Output Printed by below Code is _____

The output printed is _____

```
def foo(n: int, r: int):  
    if n > 0:  
        return (n % r) + foo(n // r, r)  
    else:  
        return 0  
print(foo(317,3))
```

SUPER 1500+ - CLASS – 5 - Homework Question - 2

#Q. The output of below python code segment is _____

```
def fun(x):
    if x > 0:
        x=x-1
        fun(x)
        print(x, end="")
        fun(x)
        x=x-1
fun(3)
```

- A) 0102010
- B) 2012010
- C) 1010202
- D) 0101010

SUPER 1500+ - CLASS – 5 - Homework Question - 3

#Q. Consider the below code:

```
def f(i):
    count=1
    if i<=0:
        return
    for x in range(i):
        k=count+g(x+1)
        count=count+x
    return k
```

```
def g(i):
    j=1
    if i<1:
        return i+1
    for x in range(i+1):
        j=j+x
    return j
```

The return value of f(4) is _____

SUPER 1500+ - CLASS – 6 - Homework Question - 4

#Q. The output printed by below code is _____

```
def fun(i,j):
    if i==j:
        print(i+j,end=" ")
    else:
        print(i-1,j,end=" ")
        fun(i-2,j+2)
fun(12,0)
```

- A) 12 0 10 2 8 4 12
- B) 11 1 9 3 7 5 12
- C) 11 0 9 2 7 4 12
- D) 12 1 10 3 8 5 12

SUPER 1500+ - CLASS – 6 - Homework Question - 5

#Q. The maximum recursion depth of below function excluding initial call is

```
def f(i,j):
    if i==j:
        return j-i
    elif i>j:
        return i-j+f(i-1,j+1)
    else:
        return i+f(i-1,j+1)
print(f(12,4))
```

A) 3

B) 4

C) 5

D) 6



2 mins Summary



- Functions
- Recursion

NEXT CLASS TOPIC: Functions, Recursion - 2

THANK - YOU