Recursion

1] Recursion in Python :

```
#background
def fun1():
    print("fun1 called")

def fun2():
    print("Before fun1()")
    fun1()
    print("After fun1()")


print("Before fun2()")
fun2()
print("After fun2()")

print()

#direct recursive program1
def fun3():
    print("GFG")
    fun()


#direct recursive program 2
print("********** program 2 **********")
def fun(n):
    if n==0:
        return
    print("GFG")
    fun(n-1)

fun(3)
```

OUTPUT :

Before fun2()

Before fun1()

fun1 called

After fun1()

After fun2()

********** program 2 **********

GFG

GFG

GFG

2] practice for recursion part 2:

```
#problem 1
print("********** Problem 1 **********")
def fun(n):
    if n==0:
        return
    print(n)
    fun(n-1)
    print(n)

fun(3)

#problem 2
print("********** Problem 2 **********")
def fun1(n):
    if n==0:
        return
    fun1(n-1)
    print(n)
    fun1(n-1)

fun(3)
```

```
#problem 3
print("****************** Problem 3 **********************")
def fun2(n):
    if n<=1:
        return 0
    else:
        return 1+fun2(n/2)

print(fun2(16))
print()


#problem 4
print("***************** Problem 4 ************************")
def fun3(n):
    if n==0:
        return
    fun3(n//2)
    print(n%2)

fun3(13)
```

OUTPUT :

********** Problem 1 **********

3

2

1

1

2

3

********** Problem 2 **********

3

2

1

1

2

3

********** Problem 3 **********

4

********** Problem 4 **********

1

1

0

1

3] Sum of Natural Number Using Recursion :

```
#problem 1
print("********** Sum of natural number **********")
def sumOfNatural(n):
    if n==0:
        return 0
    else:
        return n+sumOfNatural(n-1)

n=int(input("Enter no : "))
print(sumOfNatural(n))
print()


#problem 2
print("********** print number from n to 1 **********")
def printNumber(n):
    if n==0:
        return
    print(n)
    printNumber(n-1)

printNumber(n)
print()

#problem 3
print("********** print number from 1 to n *********")
def printNo1toN(n):
    if n==0:
        return
    printNo1toN(n-1)
    print(n)

printNo1toN(n)
print()
```

OUTPUT :

********** Sum of natural number **********

Enter no : 3

6

********** print number from n to 1 **********

3

2

1

********** print number from 1 to n *********

1

2

3

4] Sum of Digit using recursion :

```
def sumOfDigit(n):
    if n==0:
        return 0
    return n%10+sumOfDigit(n//10)

n=int(input("Enter No : "))
print(sumOfDigit(n))
```

OUTPUT :

Enter No : 123

6

5] Tower of Hanoi :

```
def THO(n,A,B,C):
    if n==1:
        print("Move 1 from",A,"to",C)
    else:
        THO(n-1,A,C,B)
        print("Move",n,"From",A,"to",C)
        THO(n-1,B,A,C)


THO(3,"A","B","C")
```

OUTPUT :

Move 1 from A to C

Move 2 From A to B

Move 1 from C to B

Move 3 From A to C

Move 1 from B to A

Move 2 From B to C

Move 1 from A to C