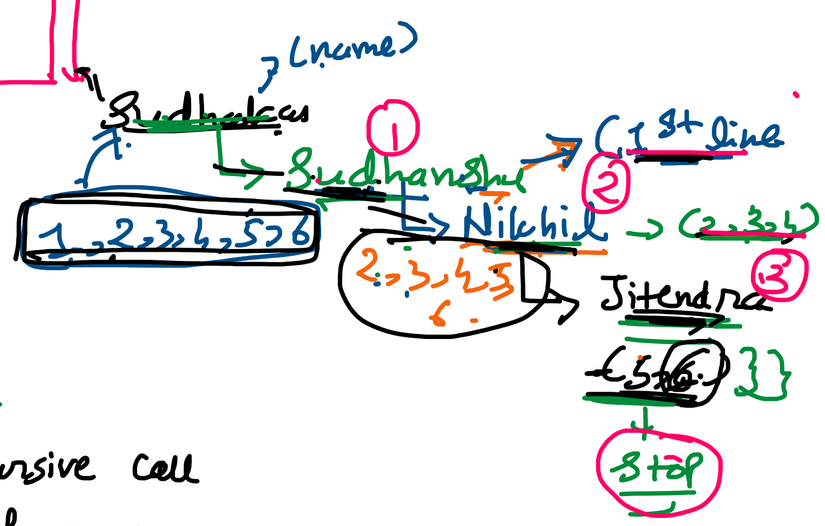
29-08 - Recursion

29 August 2022 20:12

trees
Maps
Heap
Backtracking
DP

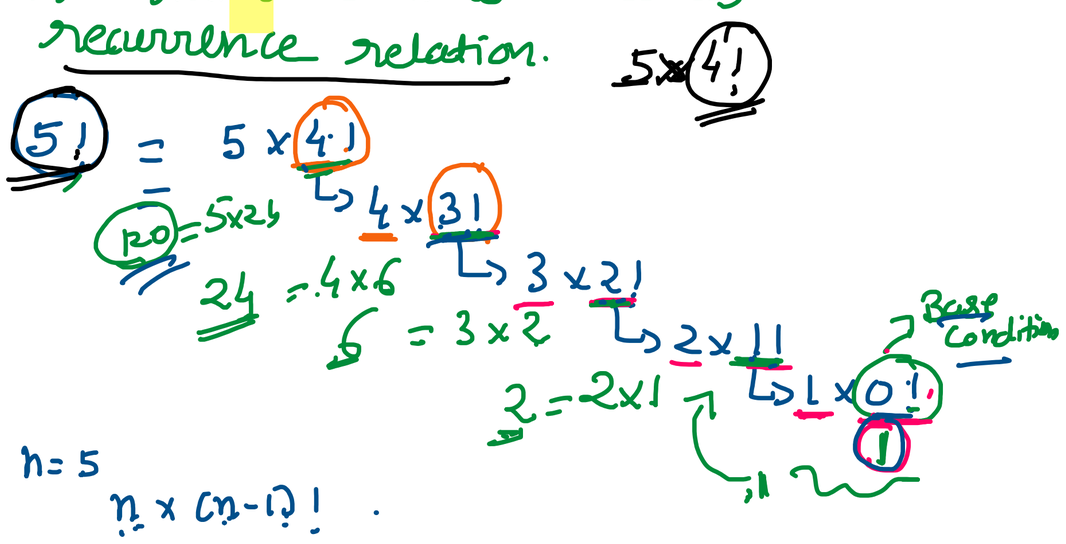


Recursion:-

1. Recursive call
2. Self work.
3. Base case.

⊕ Recurrence Relations:-

→ The mathematical representation of the recursive function is called as recurrence relation.



fact(5) = fact(4) * 5

fact(n) = fact(n-1) * n;

f(n) = f(n-1) * n

function calls itself: → Recursion:.

With every recursive call, we actually add a new Stack frame in our call Stack.

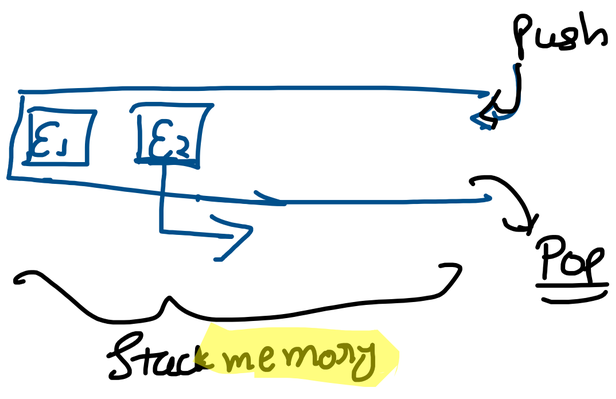
FIFO

Stack of chair

Last → First

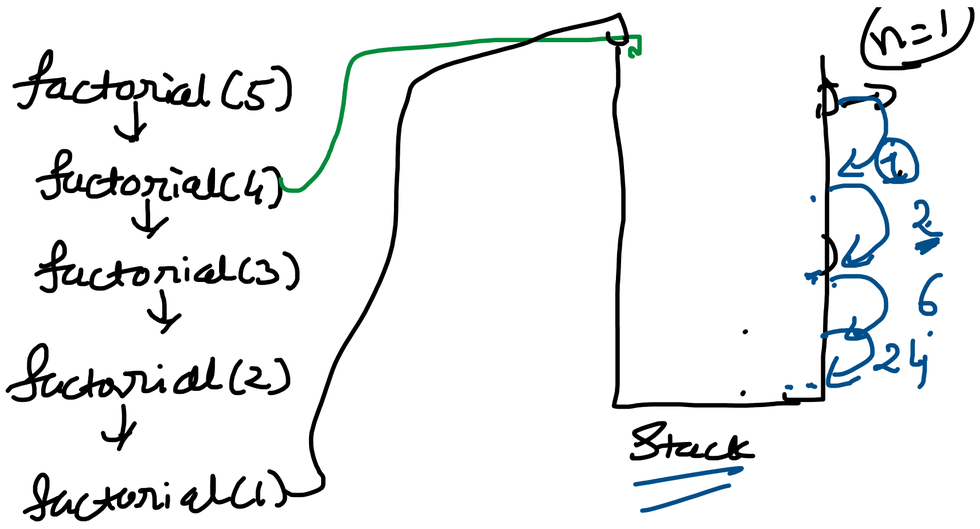
LIFO

Stack.

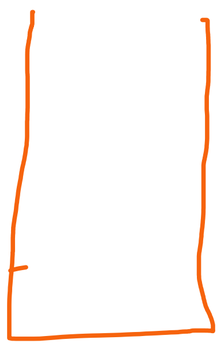


Stack → variables & fn will be stored

Heap → Objects




```
function one()
{
    two()
}
function two()
{
    three();
}
function three()
{
    console.log("Hello");
    one();
    one();
}
```



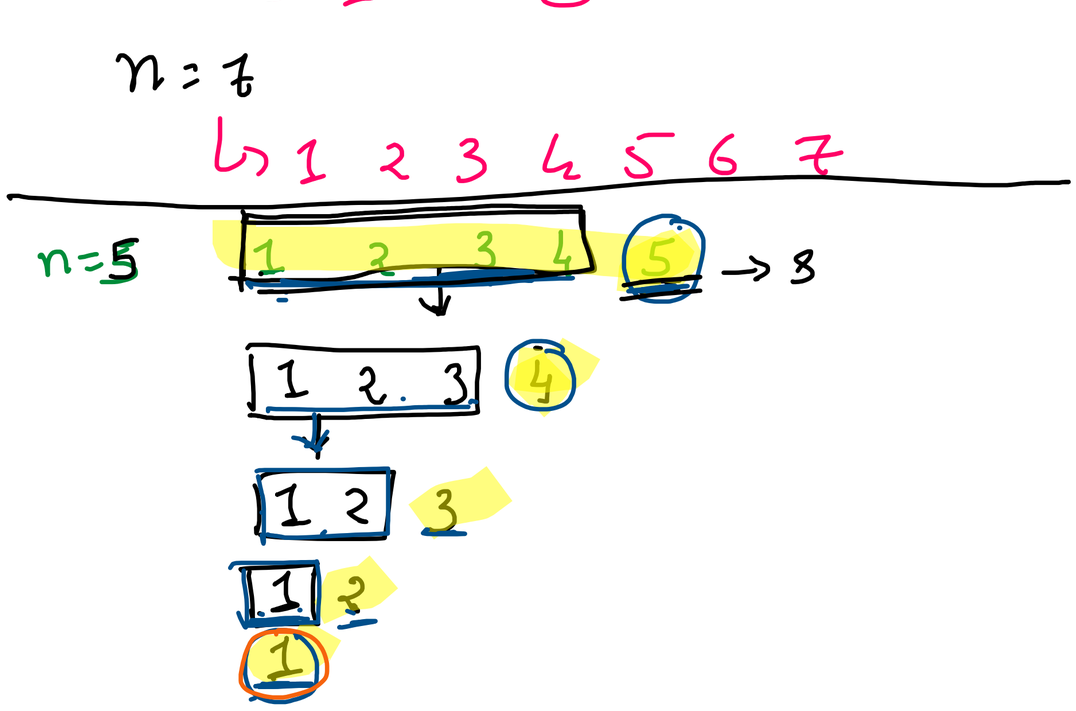
O/P
Hello

Q. Print increasing Series.

n=5
↳ 1 2 3 4 5

n=3
5 4 3 2 1
↳ 1 2 3

n=7
↳ 1 2 3 4 5 6 7




```
Print(5) {
    Print(4) //
    5
}
```

```
Print(n) {
    Print(n-1);
    Console.log(n)
}
```

Pseudo code

```
PrintInc(n) {                                   (1)
    if(n == 1) {                                } Base Condition
        console.log(1);                         }
    } return;
    PrintInc(n-1); // Recursive call            (2)
    Console.log(n); // Self work                (3)
}
```

Q. Fibonacci Series:-

Find nth fibonacci term/no

0 1 1, 2 . 3, 5 8 13 21 . . . .

0th 1st 2nd 3rd 4th 5th . . .

n = 3 → (2)

n = 5 → (5)

ith term of a fibo series is a sum of previous 2 elems.

→ Bigger Problem

[nth fibo term] (15th)

(n-1)th term (n-2)th term + 14th 13th

(+)

Recurrence relation.

$f(n) = f(n-1) + f(n-2)$

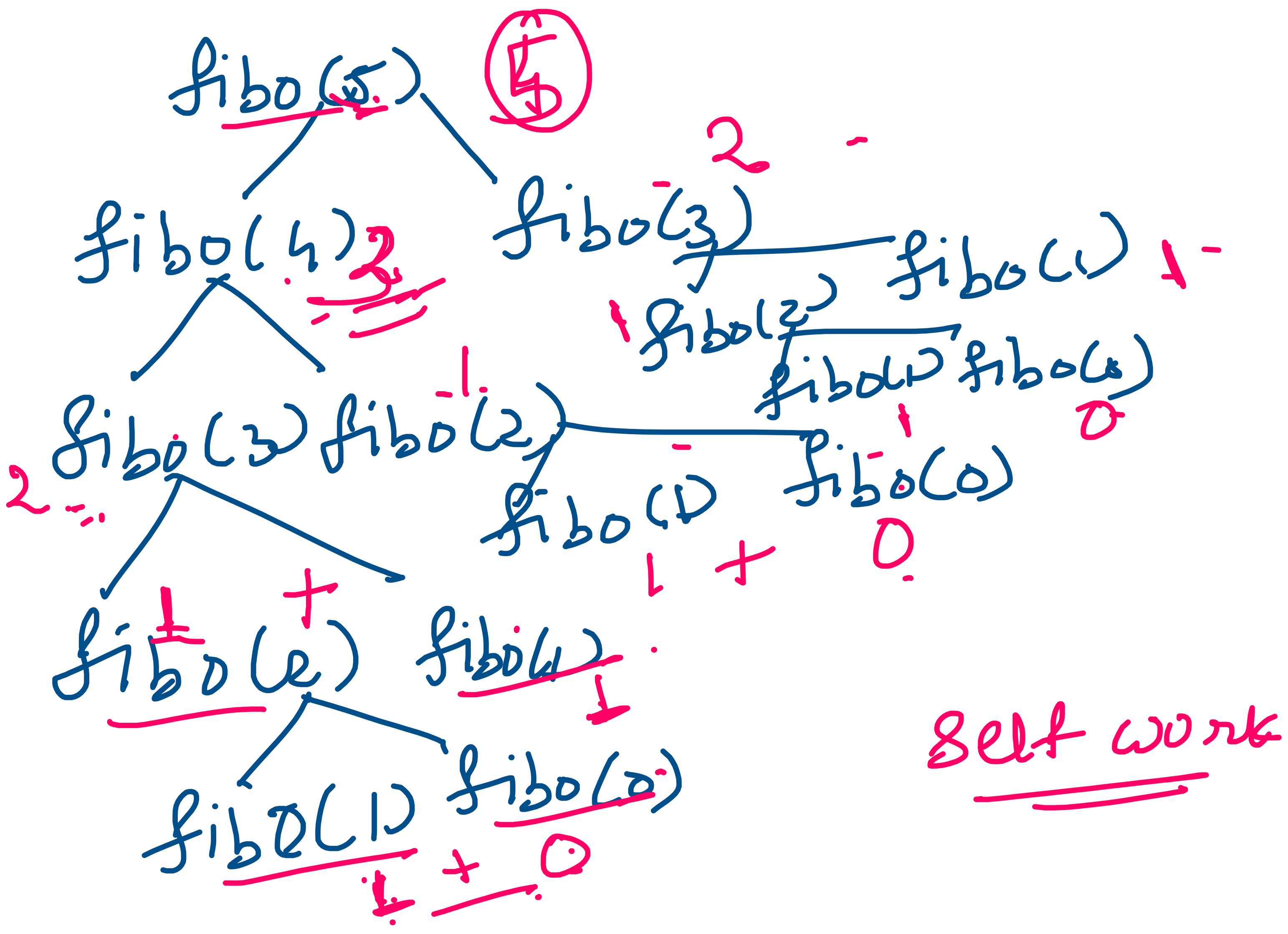
Base case

0 → 0 }

1 → 1. }

(5)

```
function fibo(n)
{  if(n == 0 || n == 1)
   {
     return n;
   }
   res1 = fibo(n-1) // 4   recursive call
   res2 = fibo(n-2) // 3   recursive call
   return res1 (+) res2
}
```



Self work

Q

[5, 4, 3, 2, 1] // false

1 2 3 4 5

sorted

1 < 2

1 > 2

first < second

f (arr, i) → Bigger Problem

f(arr, i+1)

Smaller Problem.

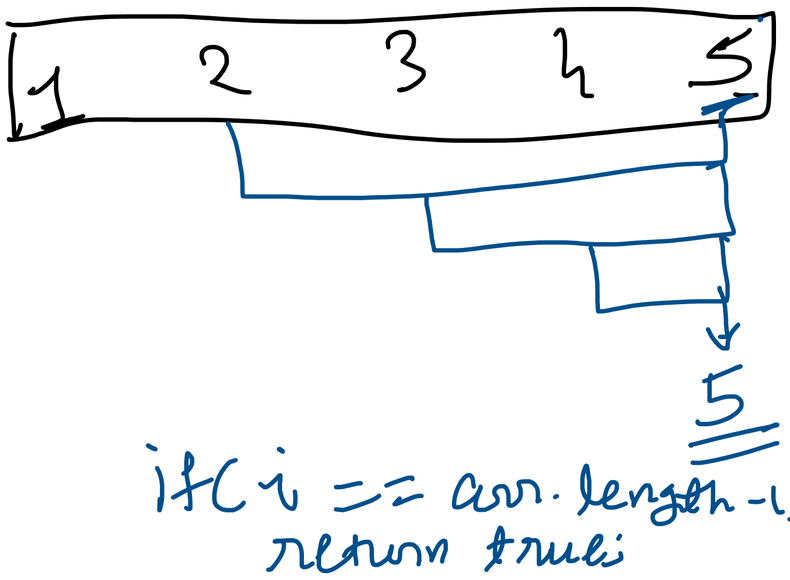
No

Yes

if(arr[i] < arr[i+1])

0

i < i+1



5

if(i == arr.length-1)
return true;