

---

---

---

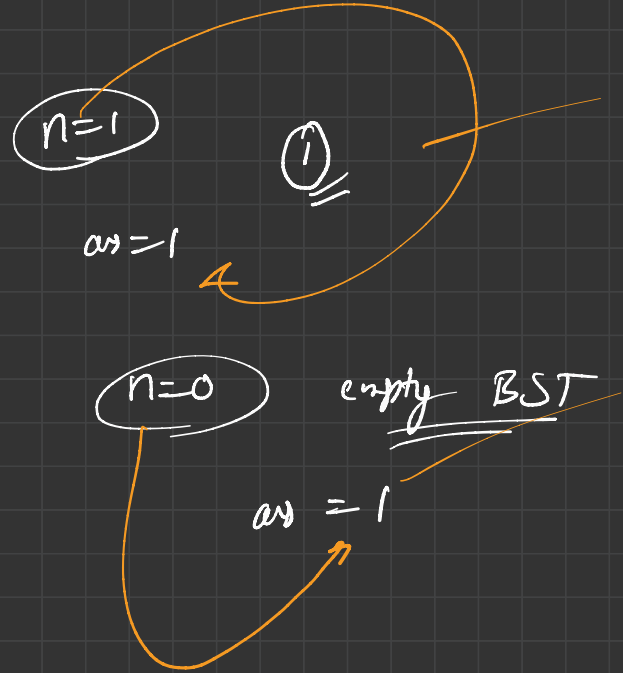
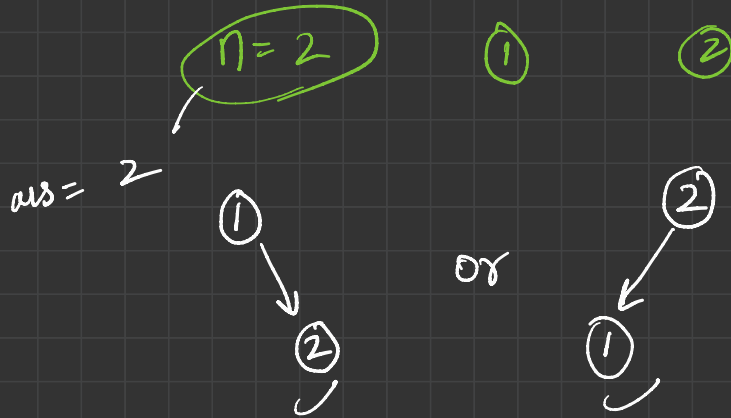
---

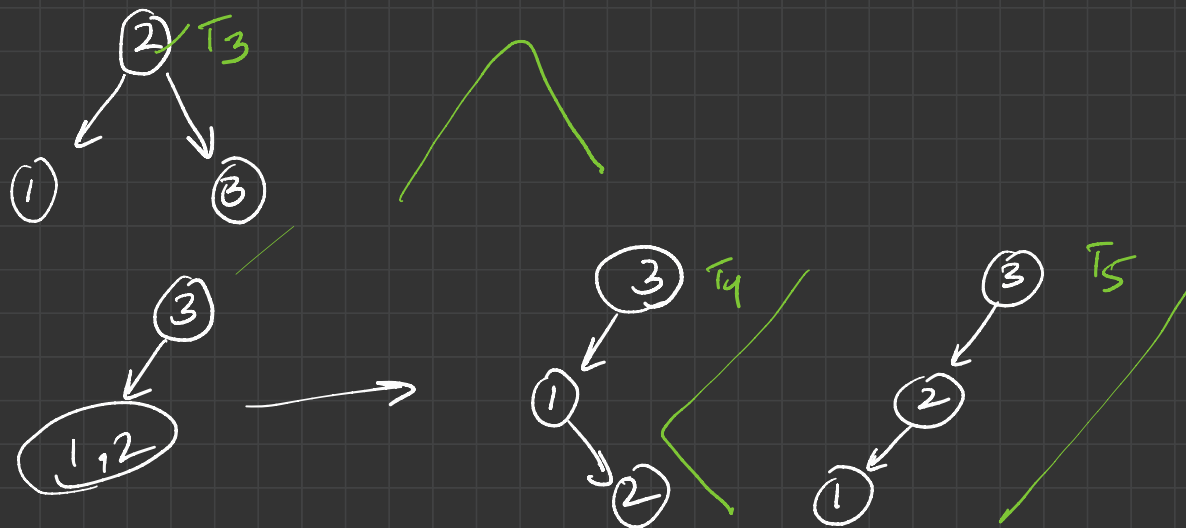
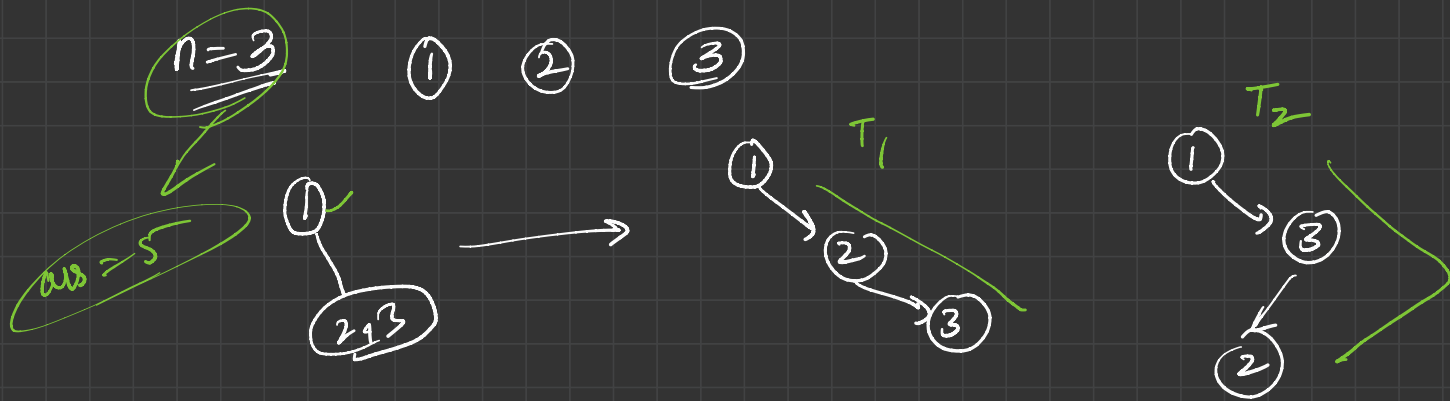
---

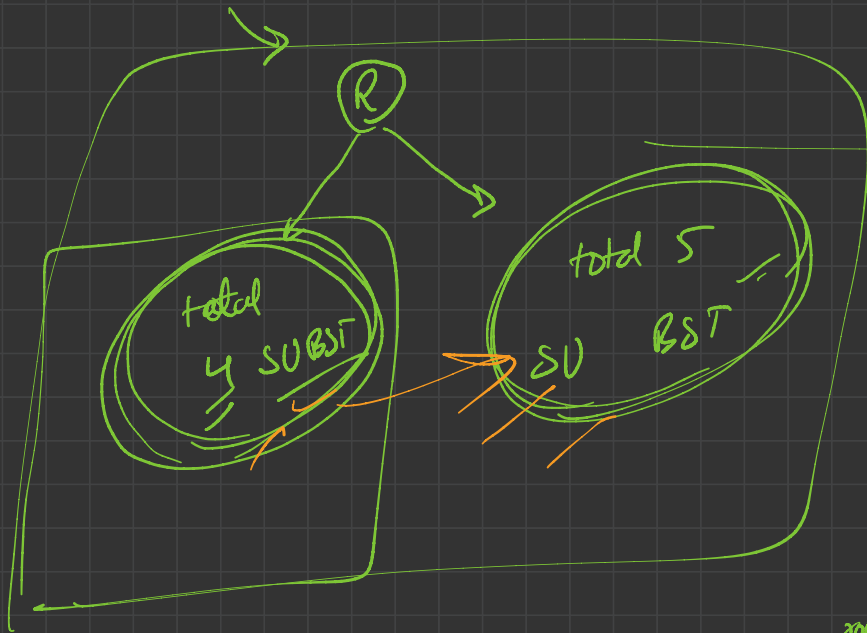


# Dynamic Programming

i/p  $\rightarrow$  int n



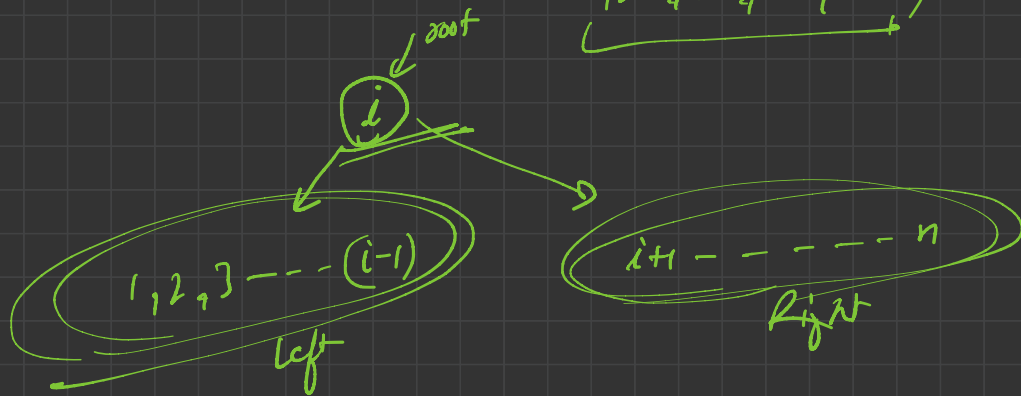




total  $\rightarrow 4 \times 5 = 20$

BST

1, 2, 3, 4,  $(i-1)$ ,  $i$  ---  $n$



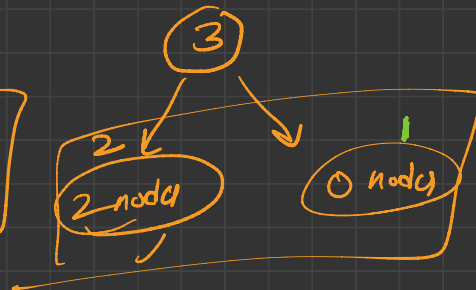
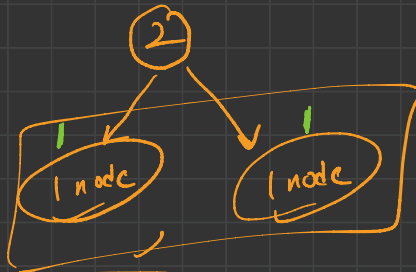
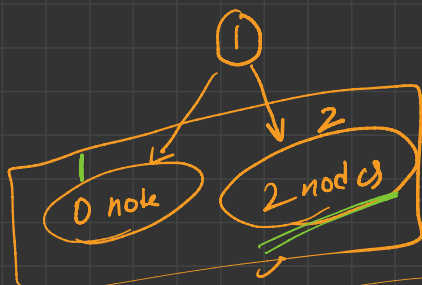
$n=3$

①

②

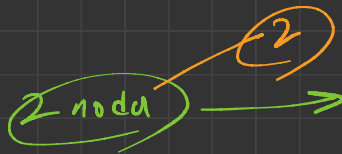
③

$f(0)$



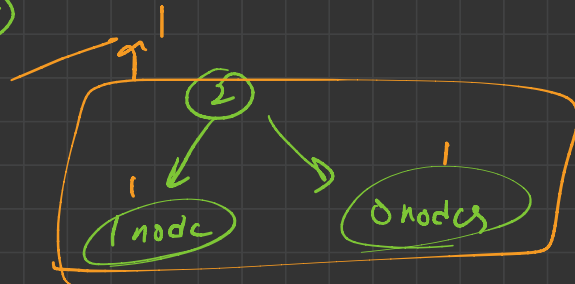
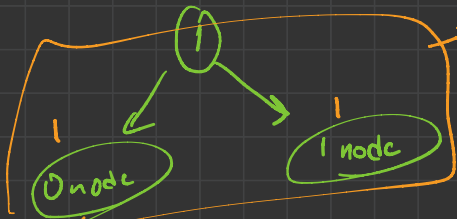
$2 + 1 + 2$

$f(n) \rightarrow f(3) \rightarrow 5$



①

②



n nodes

1  $\rightarrow$  Root

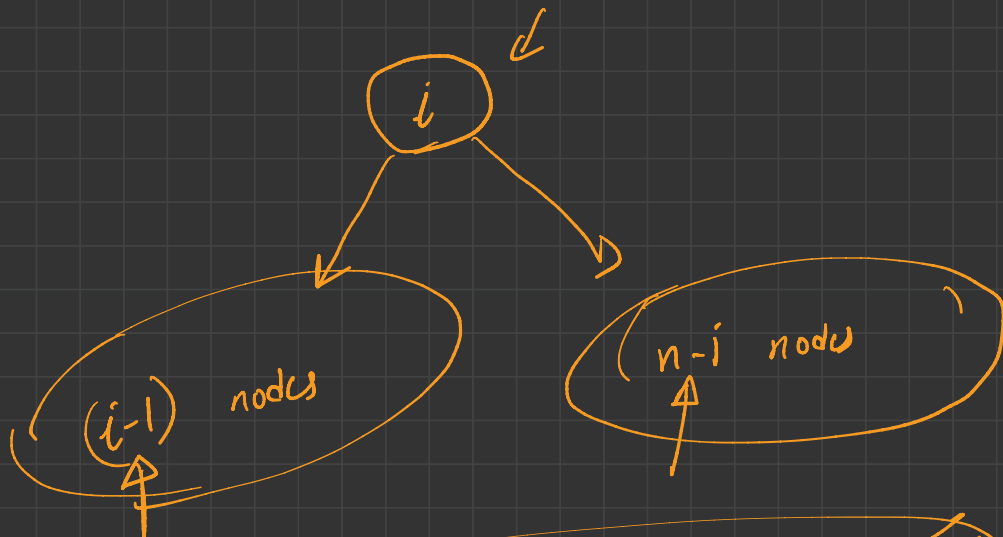
2  $\rightarrow$  Root

3  $\rightarrow$  Root

1

i  $\rightarrow$  Root

n  $\rightarrow$  Root



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

for all  
i's

$$f(n) = \sum f(i-1) * f(n-i)$$

↗

$$n=0 \rightarrow 1$$

$$n=1 \rightarrow 1$$

$$n=2 \rightarrow 2$$

$$n=3 \rightarrow 5$$

$$n=4 = 14$$

Catalan numbers

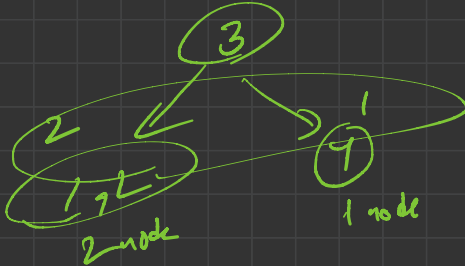
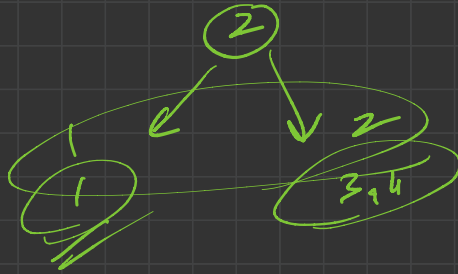
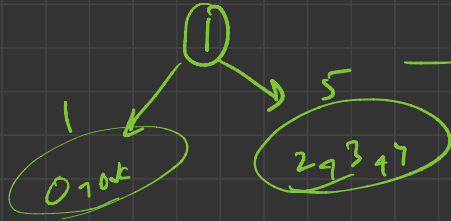
$n = 4$

①

②

③

④



→ 2

→ 2

