Bit Manipulation:

0: 0000
1: 0001
2: 0010
3: 0011
⋮

	3rd	2nd	1st	0th
5:	0	1	0	1
mask:	0	1	0	0
&	0	1	0	0

!=0 bit set
==0 bit 0

ith bit set ?
→ 1
unset:
→ 0

bit & 1 = bit
0 & 1 = 0
1 & 1 = 1

1: 0001
1<<1: 0010
1<<2: 0100

1<< 2 times
1<< i times : mask (ith bit set)

no & mask !=0 → bit 1
==0 → bit 0

no & (1<<i) !=0 → bit 1
==0 → bit 0

ith bit 1 place

	3	2	1	0
no:6	0	1	1	0
mask	1	0	0	0
|	1	1	1	0

3rd bit 1
bit | 1 = 1

no | mask
no | (1<<i)

Check i bits longest no ?

4 bit 1 1 1 1 = 15 = $2^4 - 1$

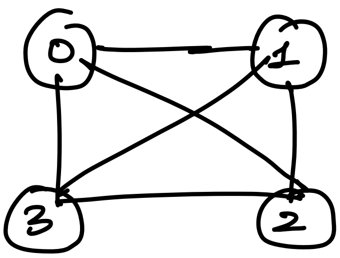
1101 ✗

1111 ✓

$2^4 - 1$ → 10000 = $1<<4$ → $(1<<4) - 1$

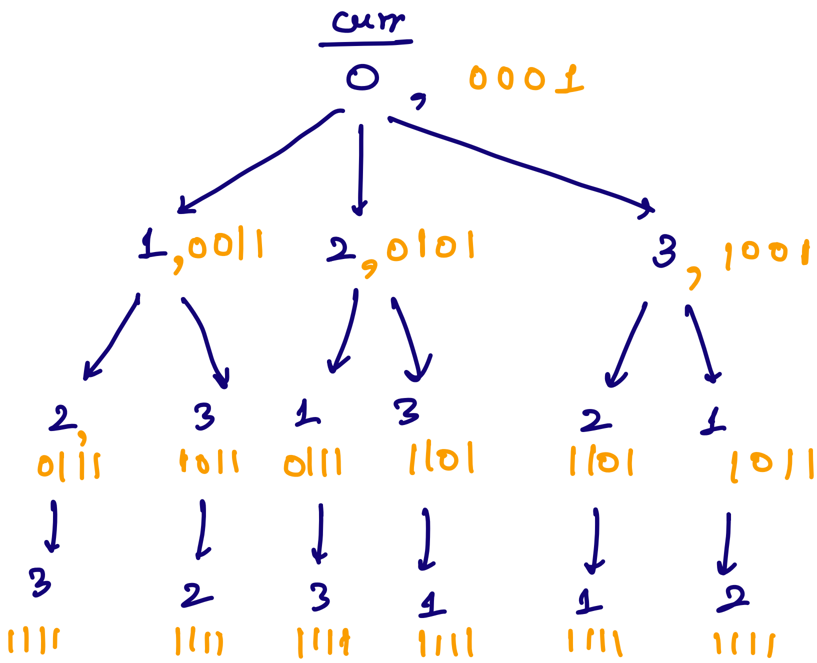
5 bit 11111 : 31 = $2^5 - 1$

$(1<<i) - 1$: i bits longest no.



3 2 1 0

_ _ _ _



Dynamic Programming

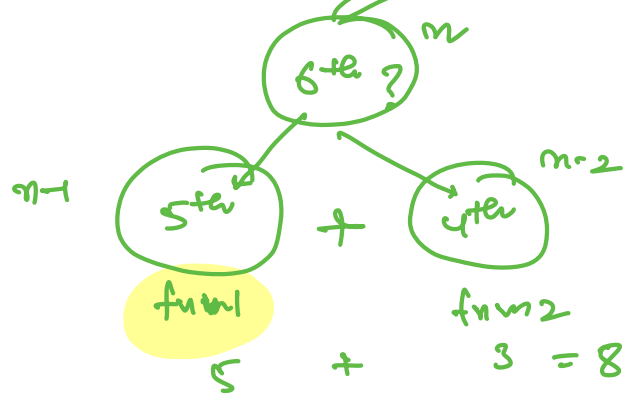
Fibonacci

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

0th 1st 2nd 3rd 4th 5th 6th 7th . . . .

Recursive :

6th fib ? ⇒ 8



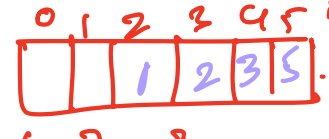
fib(6)

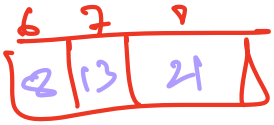
fib(5) + fib(4)

5 3

DP:

Strg





Top Down / Memoization

19^2

19 × 9

+

(9^2)