Dynamic Programming

- Top down
- Bottom up

* Top down ⇒ Function + Memo
  Recursive

* Bottom up ⇒ For loop + array

Dnc vs DP

Dnc
Kompleksitas Ringkat
Memori Gacor

DP
Memori Rungkat
Kompleksitas Gacor

Kita punya lantai berukuran 1 x 10, mau diisi dengan ubin berukuran 1 x 1 dan 1 x 2, pemasangan tidak boleh tumpang tindih. Berapa banyak cara pemasangan ubin pada lantai jika pemasangan ubin dapat di rotasi atau refleksi sedemikian rupa

→ Variable dinamis Perm

DP

1. inisialisasi $dp(n) = \ldots ?$ $f(n) = \ldots ?$
2. Model Rekursif / Transisi: Dp → Abstraksi
3. Base case

1. optimasi Min-Max
2. kombinatorika
3. Traverse

1 Lantai berukuran 1 x N

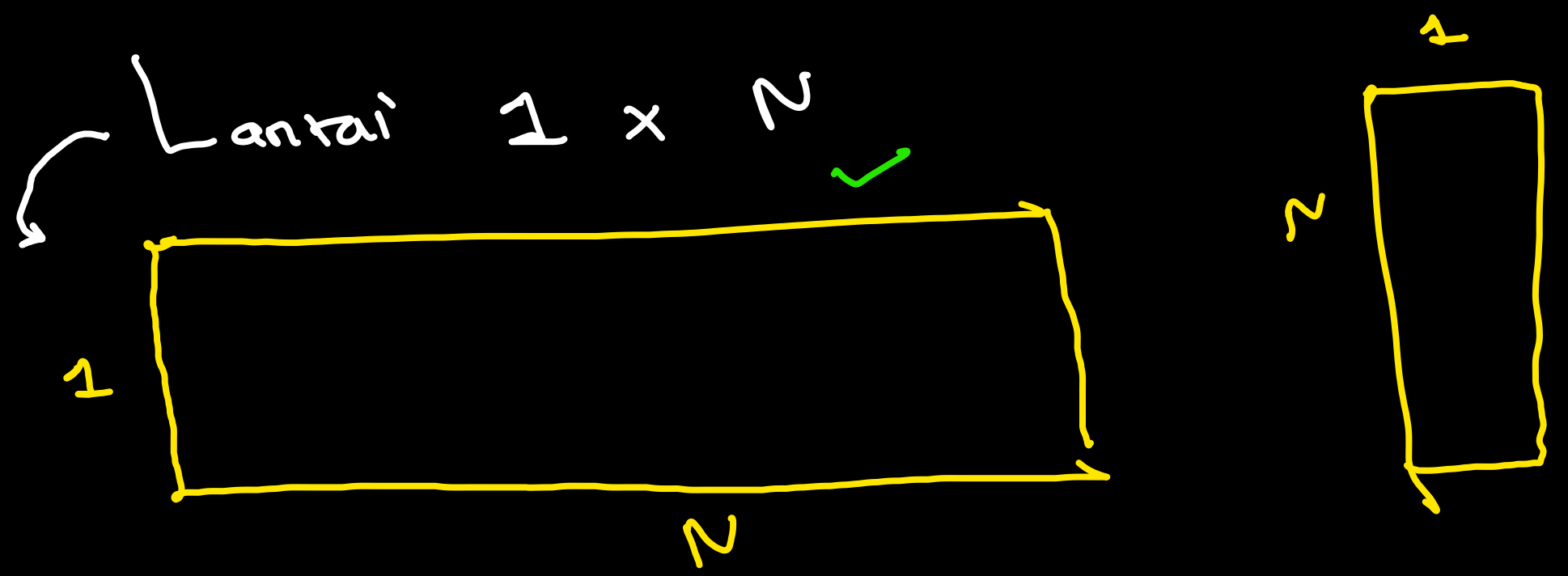
dp(n) = menyatakan banyak cara memasang ubin pada lantai berukuran 1 x N.

2

* Abstraction

Visual —— Tertulis

Rumah →



* Bottom - Up Transisi
* Top down Transisi

f(i) → f(i+1) → f(i+2) → ... → answer

answer → f(i-1) → ... → ✓ answer

f(1) → f(0)

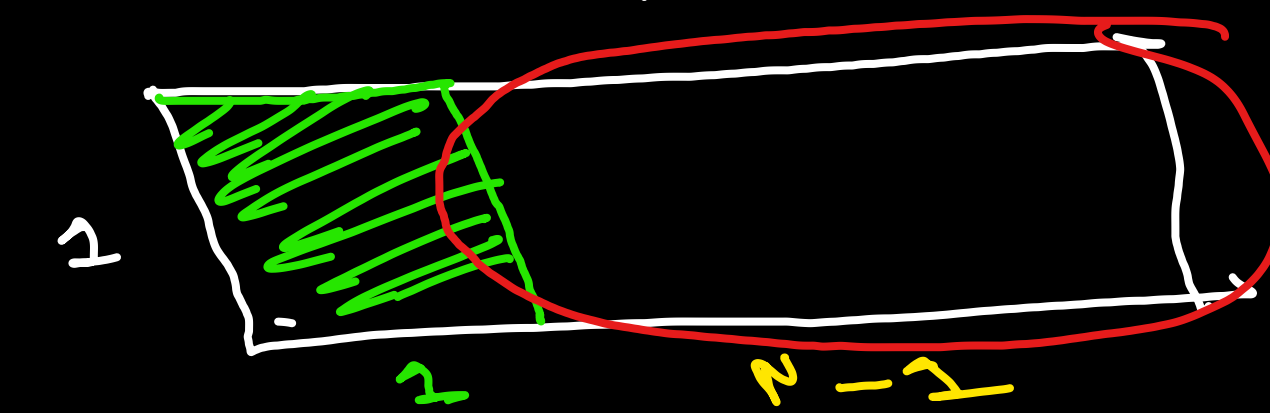
f(n) / 2p(n)

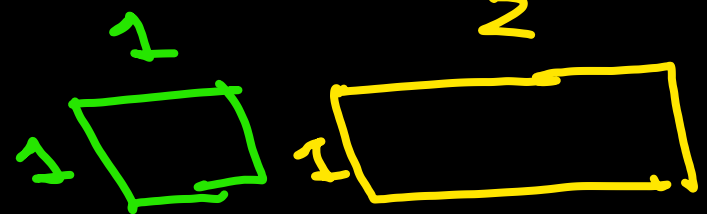
Literal base : Teori, Panduan → ikutin aja

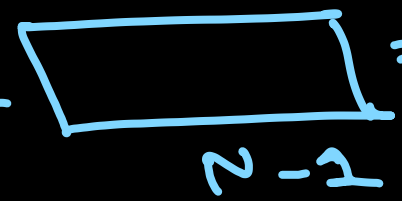
Experimental : Intuitional, berbau bentuk sgt banyak

↳ Kasus Real Life

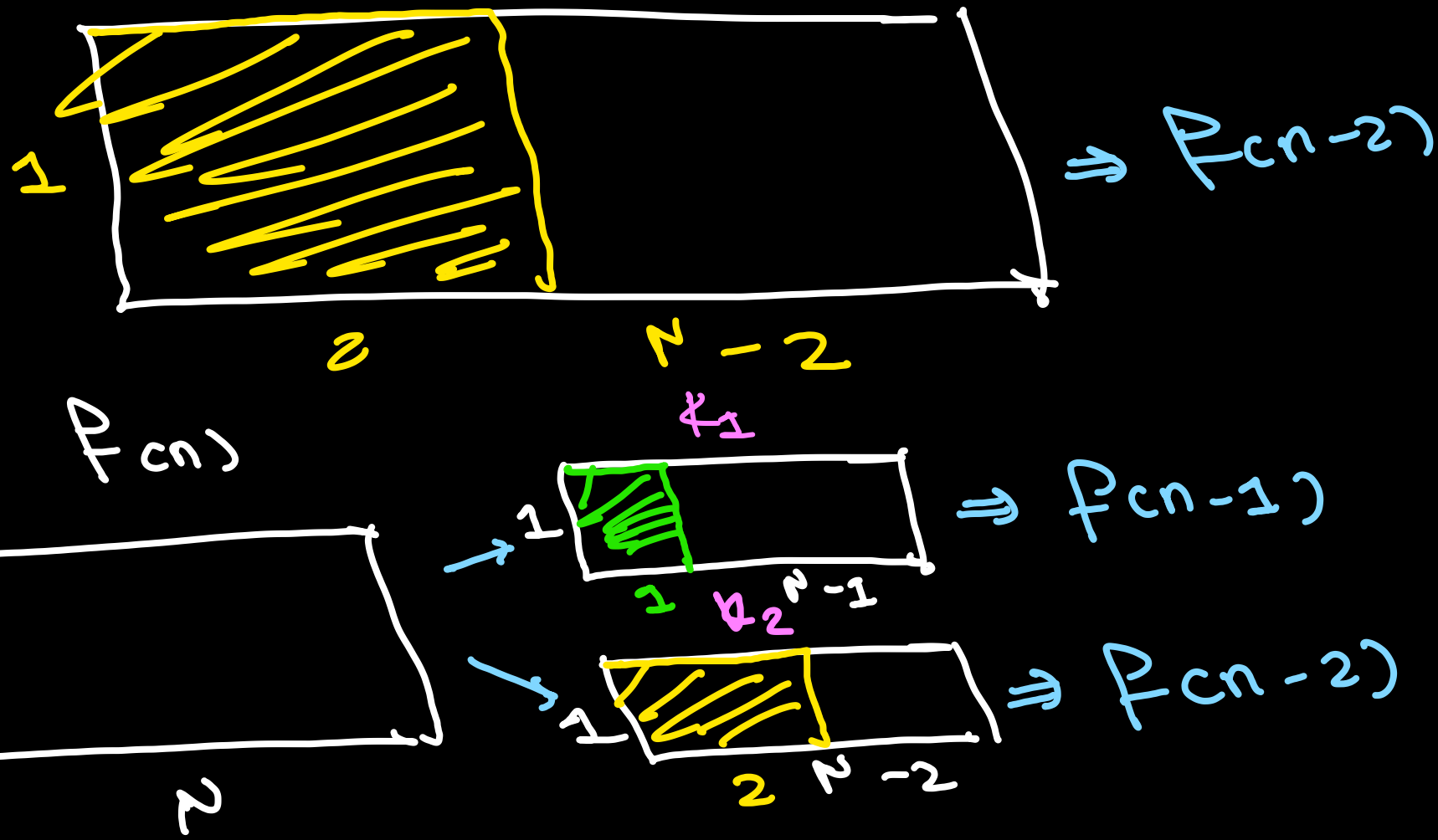
⟹ F(n)





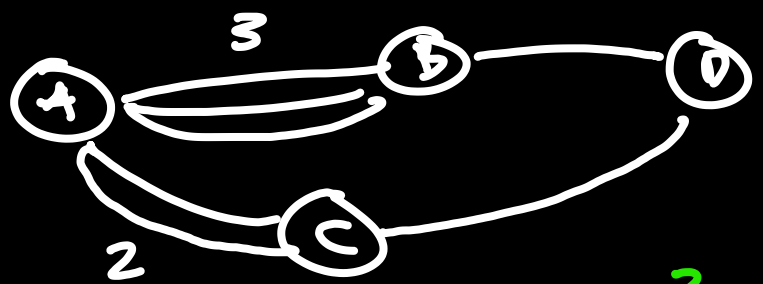


⟹ F(n-1)



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

Kaidah Pencacahan



3 cara

K_1 : A – B – D

K_2 : A – C – D

2 cara

} K_1 & K_2 Saling Lepas

+

3 + 2 = 5 cara dari A ke D

(3) $F(n) = F(n-1) + F(n-2)$

$F(1) = 1$  $= 1$ caso

$F(2) =$  $= 2$ casos

$F(10) =$

$F(9) =$

$F(8) =$

$F(7)$

$F(6)$

$F(5)$

$F(10) = F(9) + F(8)$

$$F(10) = F(9) + F(8)$$

$$F(9) = F(8) + F(7)$$

$$\vdots$$

$$F(3) = F(2) + F(1) = 3$$

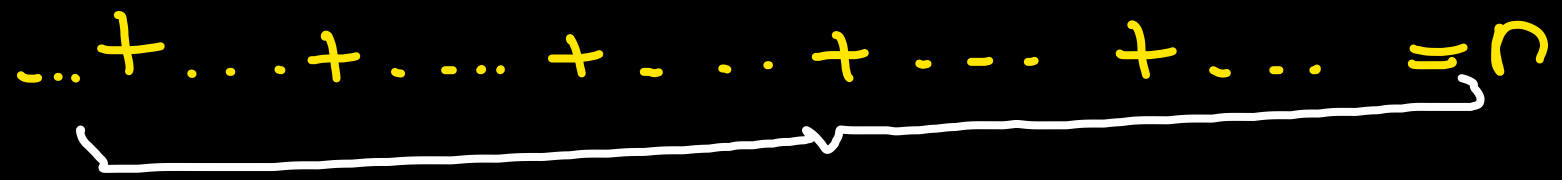
$F(9)$

Banyak yang Valid > invalid

Jawaban = Semua kemungkinan − invalid

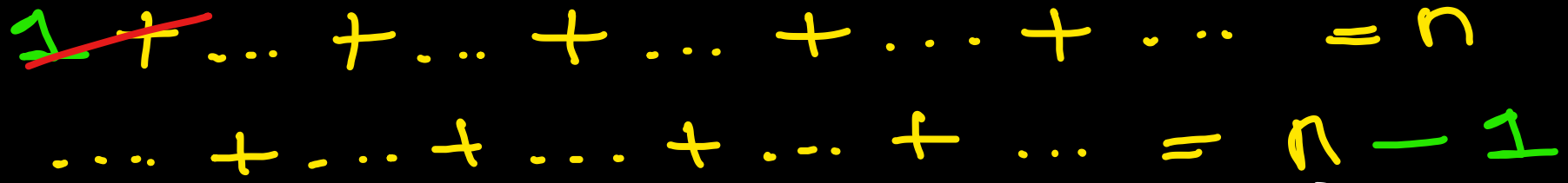
Putih − invalid

1. f(n) = Banyak cara menjumlahkan sehingga hasilnya adalah n



f(n)

1 + 2 + 3 = 6
3 + 3 = 6
} = f(6)



f(n-1)

$2 + \dots + \dots + \dots = n \Rightarrow f(n-2)$

$3 + \dots + \dots + \dots = n \Rightarrow f(n-3)$

$\vdots$

$i + \dots + \dots + \dots = n \Rightarrow f(n-i)$

~~$n = 9 \quad i = 10 \Rightarrow 10 + \dots = 9$~~

~~$n = 9 \quad i = 9 \Rightarrow 9 + \dots = 9$~~

$i < n$

$$f(n) = \sum_{i=2}^{n-2} f(n-i)$$

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

$f(9) = f(9-1) + f(9-2) + f(9-3) + \ldots$

$+ f(9-8)$

$f(8) + f(7) + \ldots$

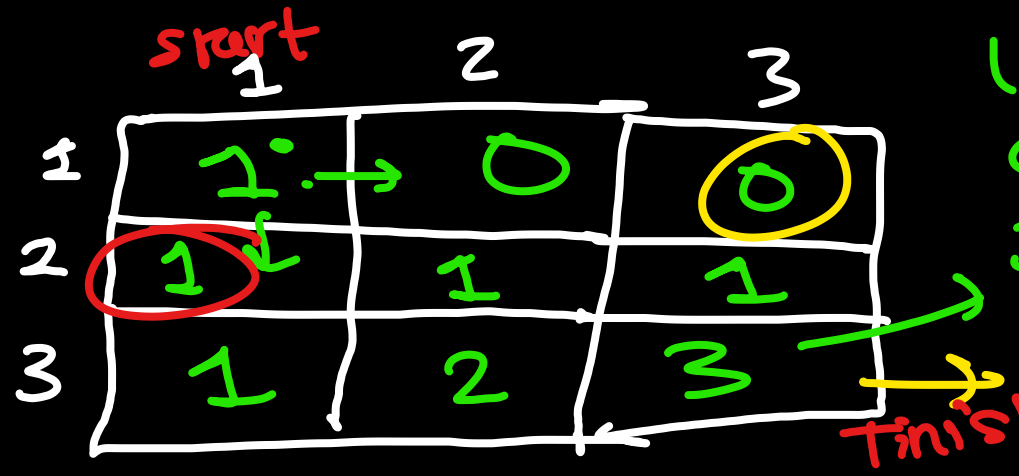
$f(0)$

-1

$9 \to 7 \to 5 \to 3 \to 1 \to -1 \to -3 \to \ldots$

$2^0 = 1$, $0! = 1$

$f(0) = 1$



(1) Kanan

(2) bawah

Tidak boleh lewat (1,2)

angka atas

angka kiri

$$f(x,y) = f(x-1,y) + f(x,y-1)$$

$$f(3,3) = f(2,3) + f(3,2)$$

item ke -	Wi	Vi	1/0
1			
2			
3			
4			

Max = n

1 → dp(n - wi, i + 1) + Vi

0 → dp(n, i+1)

Max

dp (n, i) = nilai kepucasan max

≤ Vi max