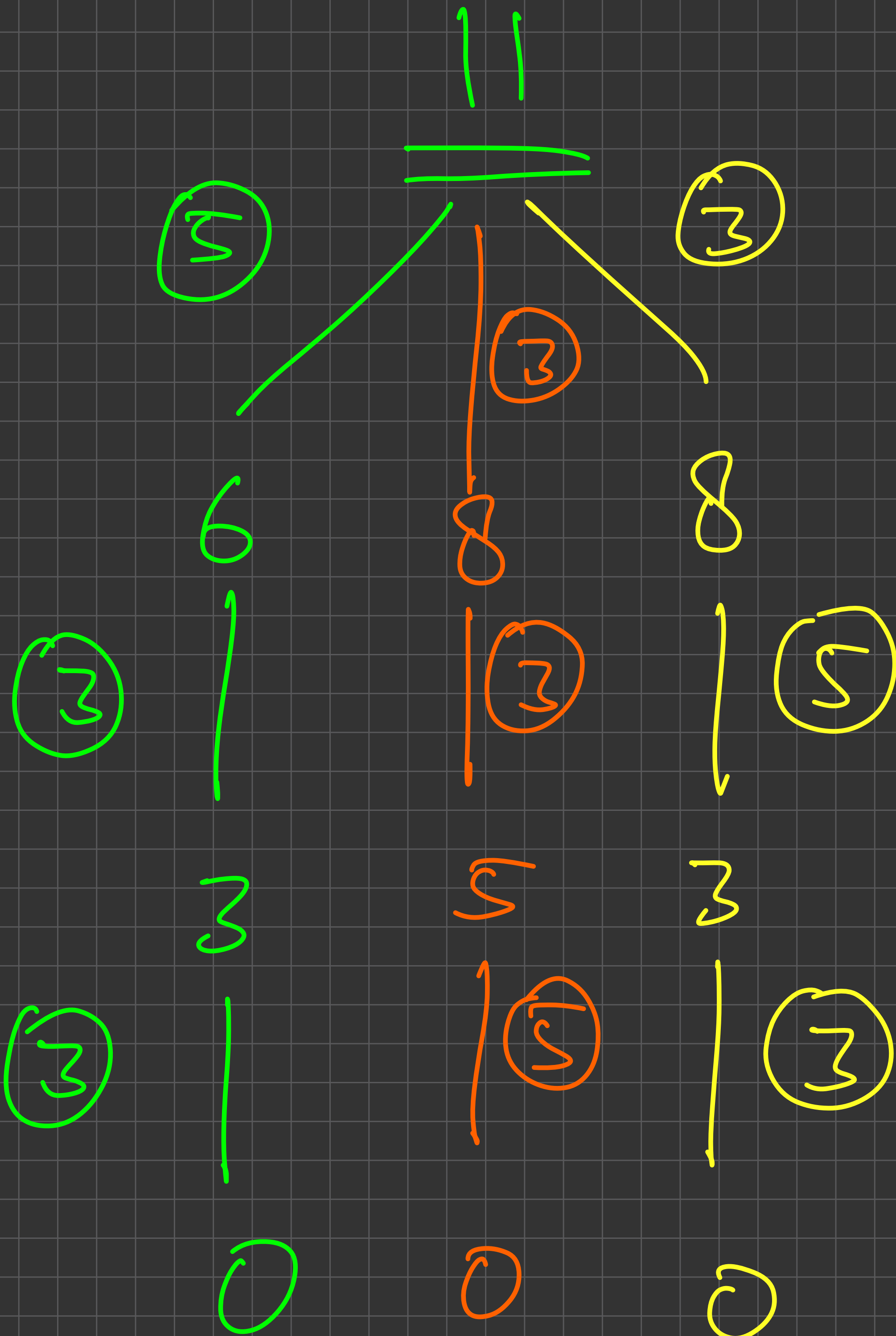
2

3

5



3	5	3
5	3	3
3	3	5

$$C_1 \quad C_2 \quad C_3 \quad C_4 \quad C_5$$

$$\left| C_1 \quad C_1 \quad C_2 \quad C_2 \quad C_5 \right| = X$$

$$\left| C_1 \quad C_2 \quad C_1 \quad C_2 \quad C_5 \right| = X$$

$$C_2 \quad C_2 \quad C_1 \quad C_1 \quad C_5$$

$$\underline{\underline{c_i < c_{i+1}}}$$

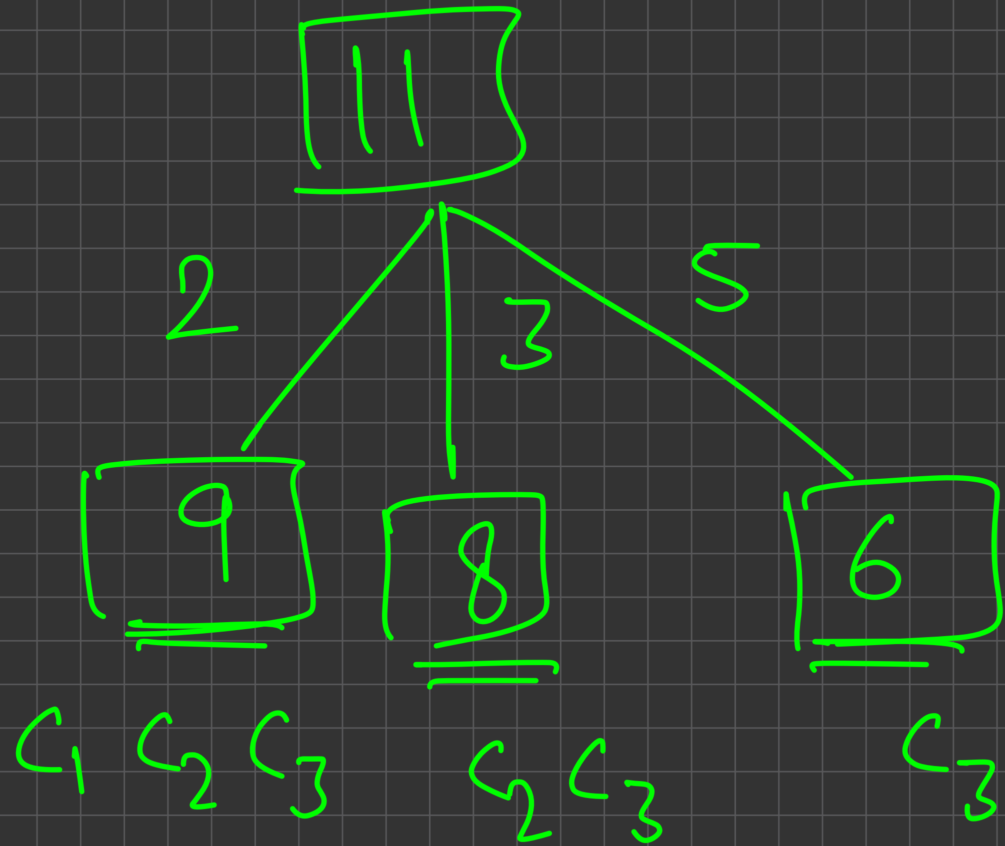
$c_2 \quad c_2 \quad c_1 \quad c_5$ ✗

$c_1 \quad c_2 \quad c_2 \quad c_5$ ✓✓

$c_1 = 2$ ✓

$c_2 = 3$

$c_3 = 5$



x , i

$$C_j < C_{j+1}$$

$$C_1 \qquad C_2 \qquad C_3 \qquad C_4 \text{ —— } C_n$$

c_1 ——— c_n

X $\quad (1, X)$

$c_1 \mid \boxed{X - c_1}$ $\quad \mid \boxed{X} c_2$

i

$(c_i \text{ upto } c_n)$

P

(i, k)

sum

pick

skipped

$(i, k - c_i)$

$(i+1, k)$

a_2

P_1 a_1

P_2

$dp[i][k]$ = no. of ways to get a sum of k such that all coins from C_i to C_n are pickable and all coins before C_i are skipped.

State

$$dp[i][k] \to \begin{cases} dp[i+1][k] & \text{skip coin } i \\ + & \\ dp[i][k-c_i] & \text{picking coin } i \end{cases}$$

transition

Base Case :

$dp[i][0] = 1$

$\forall$ i from 1 to n

final subproblem

dp[1][x]

Time Complexity :

states × T.T

$$dp[i][k] \; \Big\langle \; + \; \underline{\underline{O(1)}}$$

i: 1 to N

k: 0 to X

$$O(nx) \cdot O(1) = O(\underline{n \cdot x})$$

Space Complexity :

$\#$ states

$$\downarrow$$

$$\left\{ O(\underset{\substack{\downarrow \\ 100}}{n} \cdot \underset{\substack{\downarrow \\ 10^6}}{x}) \right\} \quad \underline{\underline{10^8}}$$

$$O(\underline{\underline{n \cdot x}})$$

$$dp[i][k] \begin{cases} dp[i+1][k] \\ dp[i][k-c_i] \end{cases}$$

$k \longrightarrow k$ and $k - c_i$

$i \longrightarrow i$ and $i+1$

$0 \longrightarrow X$

$0 \longleftarrow N$

L.H.S. $\longrightarrow$ R.H.S