1259 Handshakes that don't cross

Dynamic Programming approach:

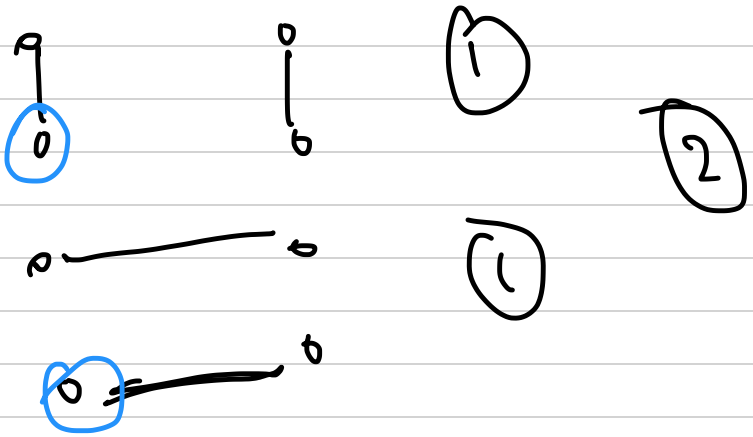
$dp(0) = 1$ initialize

$n = 2$

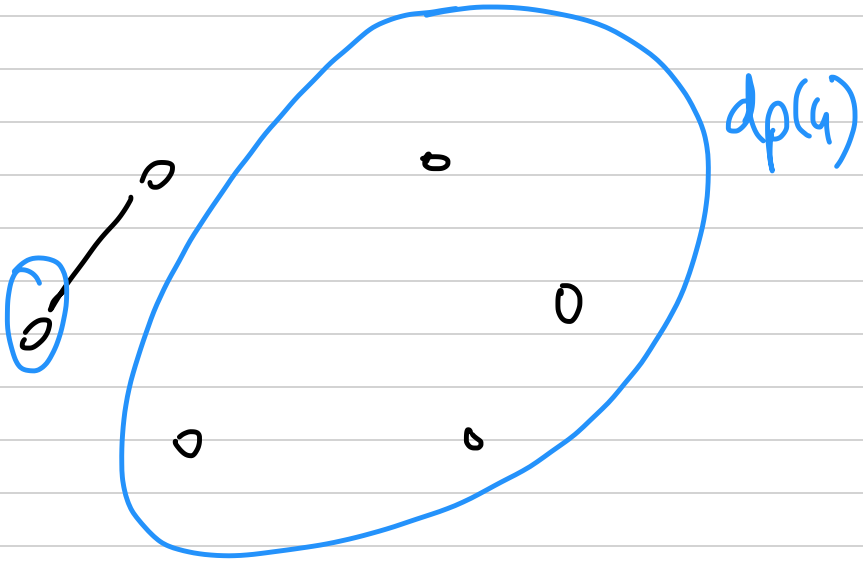
1

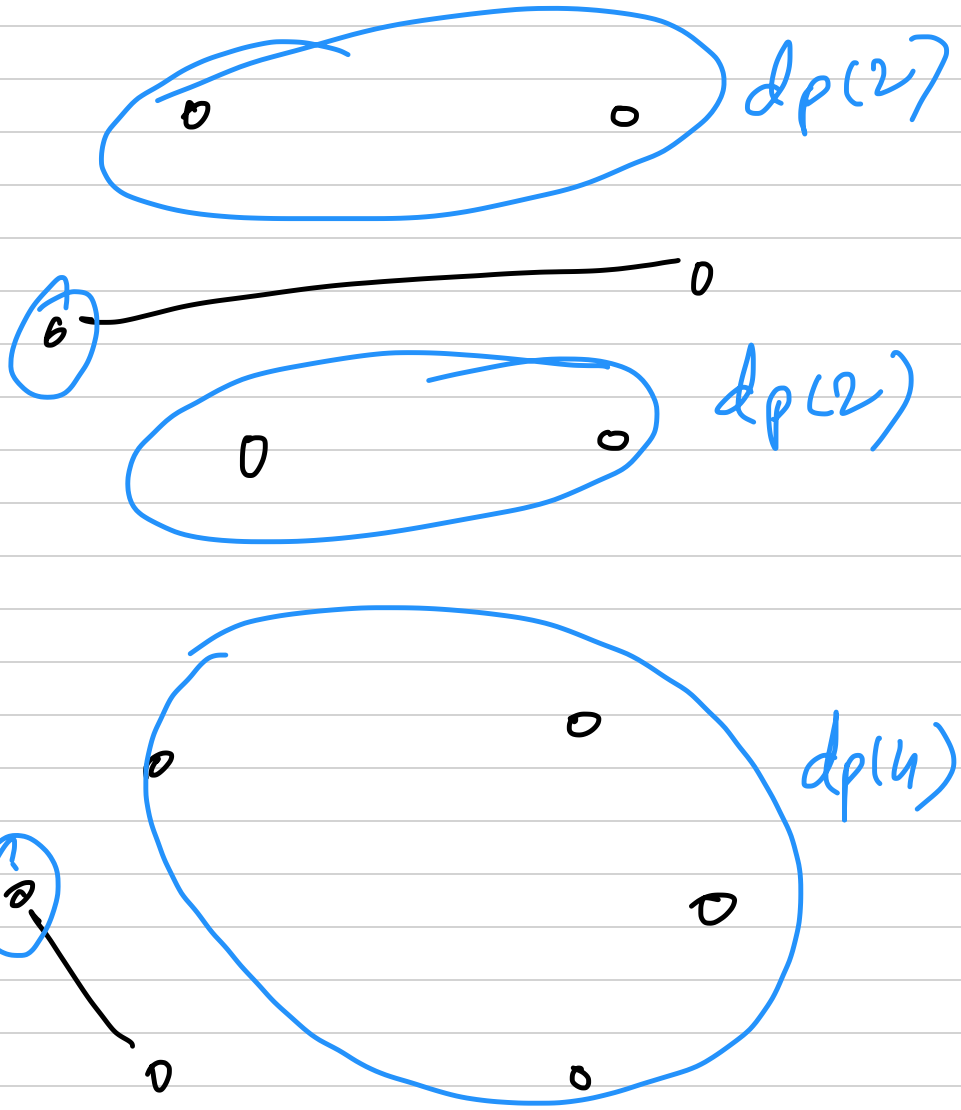
only 1 possibility

$n = 4$



$n = 6$



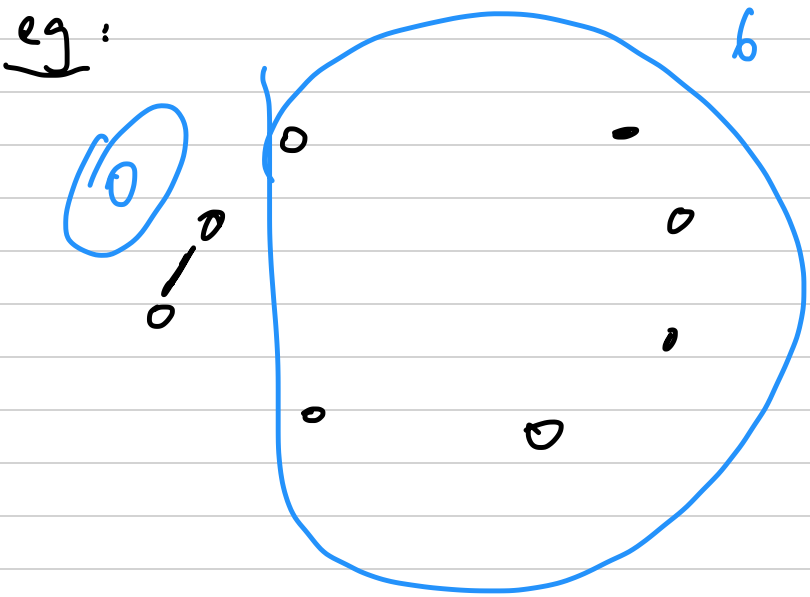


$$dp(6) = dp(4) \times dp(0) + dp(2) \times dp(2) + dp(0) \times dp(4) = 5$$

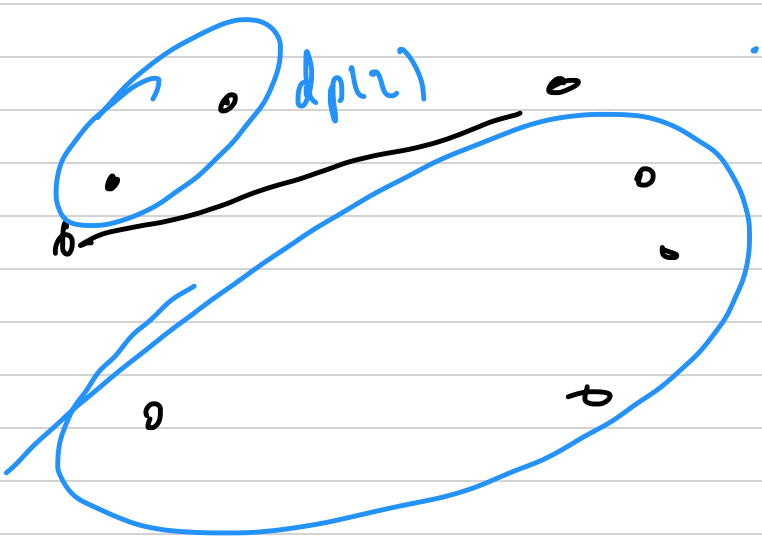
∴ For some n

we will select a person and pair him with some other person such that they divide circle into 2 circles of even size.

eg:

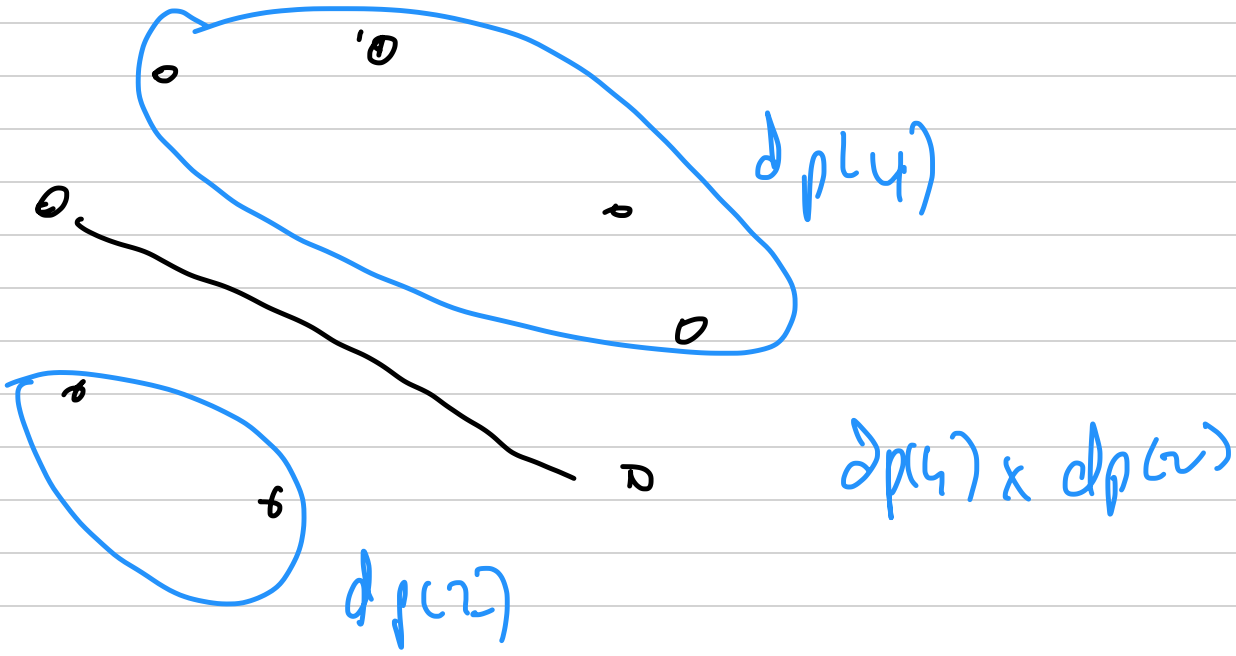


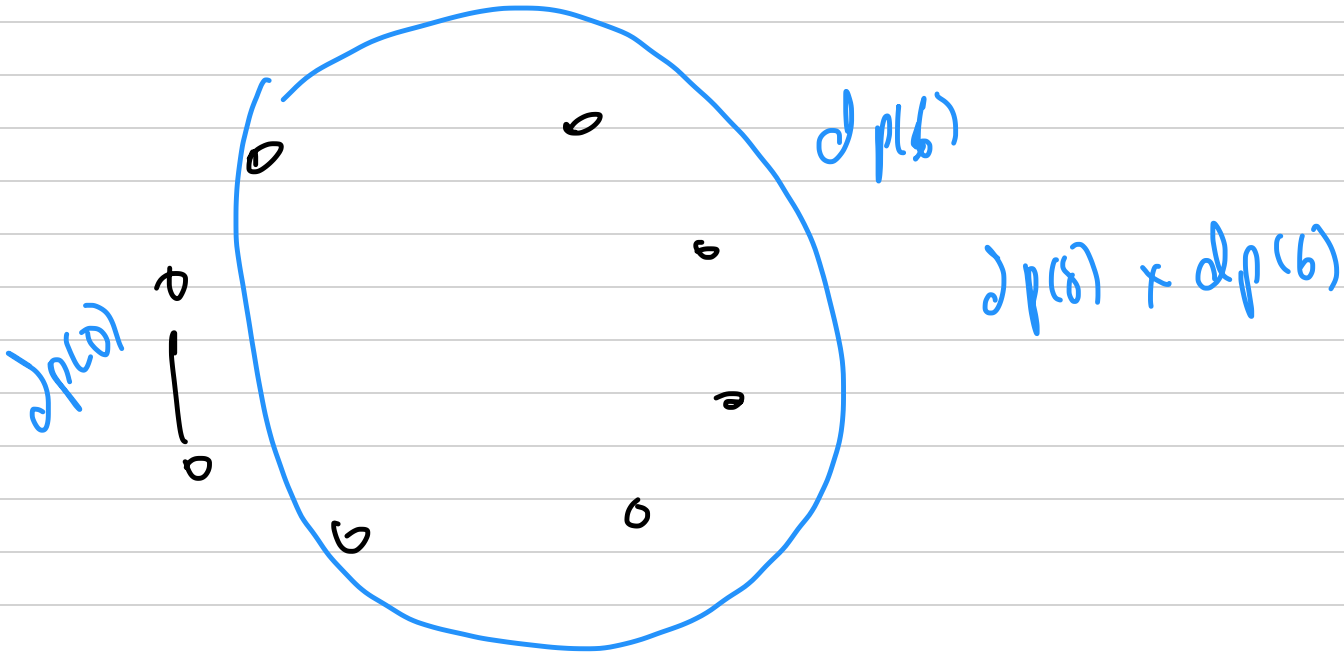
$\therefore dp(6) \times dp(6)$



$\therefore$

$dp(4) \times dp(2)$


$\partial p(4)$
$\partial p(4) \times \partial p(2)$
$\partial p(2)$


$\partial p(6)$
$\partial p(8) \times \partial p(6)$
$\partial p(8)$

∴ As seen if n = 10

(i) we will select a node and pair it in all cases such that 2 split groups are of even size

(ii) And sum of people in two groups will be $\underline{n-2}$ as we have manually formed 1 $\underline{\text{handshake}}$

for 'n' people

∴ Initialize dp[ ] → 'n+1' size

dp(0) = 0

dp(2) = 1

$$dp(n) = \sum dp(x) * dp(y)$$

x, y

x ≥ 0

y ≥ 0

x + y = n - 2

→ Rec formula (1)

for x = 4 to n

Rec formula (1)

return dp[n]