

Recursion Concepts & Qns ...

Motivation (भाषण) ...



Hard work is the bridge
between dreams and
reality. The more effort
you put in, the closer
you get to your GOAL.

dream ← → reality

”

#codestorywithMIK



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Company :-

SAMSUNG

22. Generate Parentheses

Medium

Topics

Companies

Given n pairs of parentheses, write a function to generate all combinations of well-formed parentheses.

$2 \times n$

Example 1:

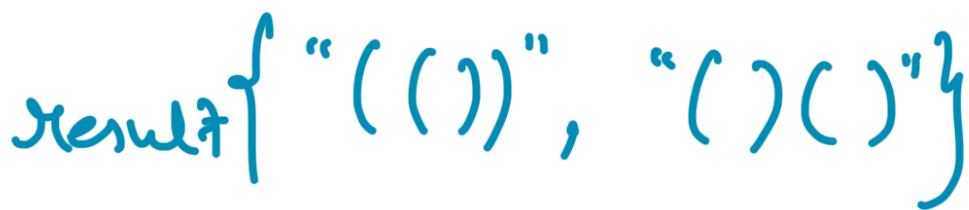
Input: $n = 3$

Output: ["((()))", "(()())", "(())()", "()(())", "()()()"]

Generate combinations } BACKT-
Permutations } (Recn).

Thought Process

length = $2 \times n = 4$ ← $n = 2$ → open = ((
close =))



Solve $(\text{" "}, n)$;

Solve (curr, int n) {

if (curr.length() == 2 * n) {

if (curr is valid) result.push(curr);
return;
}

Do
Something
Explore

curr.push-back("(");

Solve(curr, n); // TRUST

undo

curr.pop-back();

Do

curr.push-back(")");

Explore

Solve(curr, n); // TRUST

undo

curr.pop-back();

}

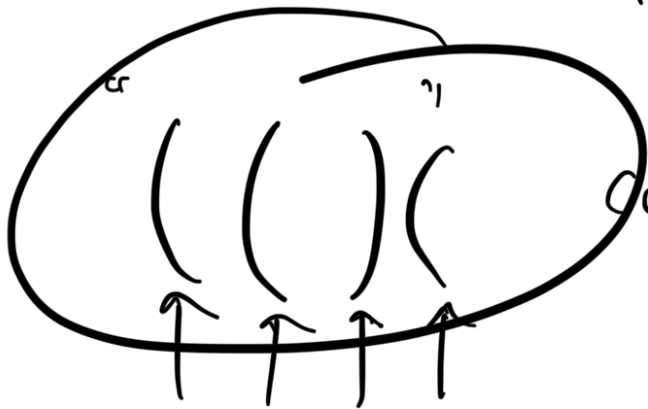
$O(2^n)$ is valid (curr) :-

"(())"

$O(2^n)$

↑↑↑↑

$$\text{Count} = 1 + 1 - 1 - 1 = 0$$



$$\text{Count} = 1 + 1 \cancel{-1} \cancel{-1} = 2 \neq 0$$

↑ C :-

n pairs

$2 \times n$



2^{2n} possibilities.

T.C. $O(2^{2n} * 2n)$

S.C. :- Depth of Rec. tree = $O(2^{2n})$.

Approach - 2

(Better) ...



open = 2
close = 0

$n = 2$

open = 2
close = 2

()
()

if (open < n)

'('

$n = 2$

"()))"

open = 1

close = 1 + 1

") () ("
↑

open = 0
close = 1

(close > open)
X

if (close < open)

1 < 2

" (()) "

close = 1 + 1
open = 1 + 1

if (open < n)
solve ... '('

if (close < open)
solve ... ')'

Story Points:-

Same as Approach-1

↓
with safety check.

No need of isValid().

I.C.:

~~X~~

$2 * n$

$\Rightarrow O(2^{2n})$

$n \rightarrow$

Catalan number.

$S.C. \Rightarrow O(2 * n) \approx \underline{O(n)}$

