

# Recursion (Print)

1) Coin Toss

n coins

n=1 H , T  $\rightarrow 2^1$

n H , HT , TH , TT  $\rightarrow 2^2$

n=3 HHH TTT  $2^3$   
 HHT TTH  
 HTH THT  
 HTT THT

n=4  $\Rightarrow (n-3 \text{ total solutions}) * (H+T)$

(H) (T)

1) BP??

CT(n)

2) SP??

CT(n-1)

3) S.W

H \* CT(n-1)

T \* CT(n-1)

4) B.C

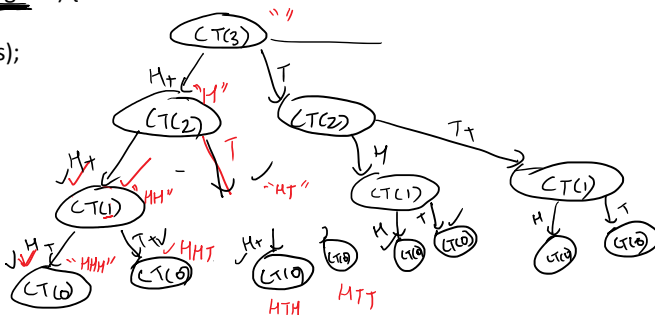
O✓

coinToss (n)

$\hookrightarrow H + \text{coinToss}(n-1)$

$T + \text{coinToss}(n-1)$

```
public static void ct(int noc, String ans) {
    if (noc == 0) {
        System.out.println(ans);
        return;
    }
    ct(noc - 1, ans + "H");
    ct(noc - 1, ans + "T");
}
```



$ct(1, HT) \{$   
 $-ct(0, HT+H);$   
 $-ct(0, HT+T);$

$\}$  HHH HTH THH TTH  
 HHT H T T T H T T T T

Subarray??

Substring??

Contiguous subpart

Subset  $\rightarrow$  NON CONTIGUOUS  
 Subsequence  $\rightarrow$

$\hookrightarrow A: \{10, 20, 30, 40\}$

B  $\{10, 30\}$

C:  $\{10, 40\}$

s1: "a b c"

s2: "a c" ✓

B C A

sb: "cb" X

"abc" → Print All possible subsequences

" " "a" "b" "c"

"ab" , "ac" , "bc"

"abc"

↳ 2 → include  
↳ exclude

✓ ✗ ✓ ✗

✓ ✓ ✓  
"abc"

⑧ 2<sup>3</sup>

a b c  
2 2 2

✓ ✗ ✓

"ac"

✓ ✓ ✗  
"ab"

✗ ✗ ✓

"c"

✗ ✗ ✗  
""

abcd

2\*2\*2\*2

1) P.SS("abc")

S.P. : P.SS("bc") ✓

↳ "", "b", "c", "bc",

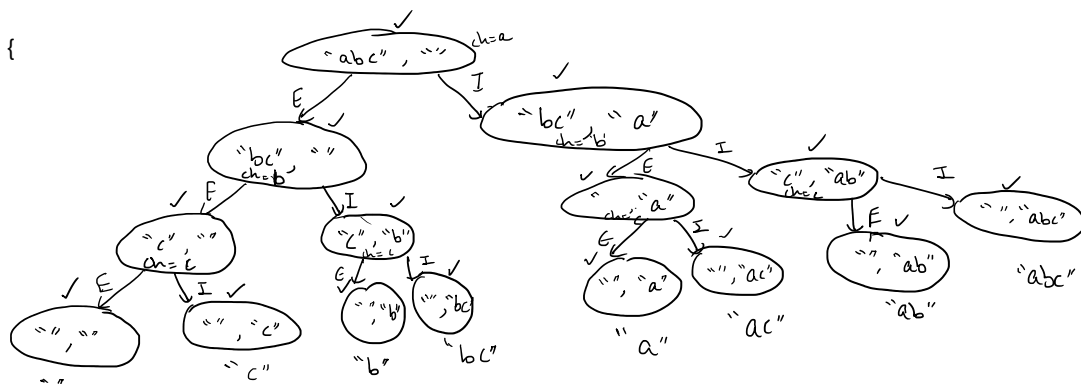
"ab", "ac", "abc"

B.C : P.SS("") → return

```
public static void pss(String str, String ans) {
    if (str.length() == 0) {
        System.out.println(ans);
        return;
    }
    char ch = str.charAt(0);
    String rest = str.substring(1);

    // exclude ch
    pss(rest, ans);

    // include ch
    pss(rest, ans + ch);
}
```



Print All subsequences with ASCII

"b"

"", "b", "98"

"ab"

"", "b", "98"

"a", "ab", "a98",

"97", "97b", "9798"