Relation between Permutation and Combination

Mathematical Relation: $^nC_r = \frac{\lfloor n}{\lfloor n-r \lfloor r}$ | $^nP_r = \frac{\lfloor n}{\lfloor n-r}$

(1) So, $\boxed{^nP_r = {}^nC_r \times \lfloor r}$

(2) Total count of characters in power set: power set $= (1+1)^n = 2^n$

$2^n = {}^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + \cdots + {}^nC_{n-3} + {}^nC_{n-2} + {}^nC_{n-1} + {}^nC_n$

n-char, n-chars, n-chars, n-chars

Since there are 2^n terms, and 2 terms togeter gives 'n' char.

So, total number of chars in power set = ((2^n)/2)*n = 2^(n-1)*n

Permuation and combination in terms of arrangment :

Permuation: Arranging 'r' distinct items at 'n' positions. Eg. Arranging 2 distinct items(a,b) at 3 positions. $^3P_2 = 6$

Combination: Arranging 'r' identical items at 'n' positions. Eg. Arranging 2 (i,i) at 3 positions → $^3C_2 = 3$

permutation of 2 identical items at 3 positions nCr

$^3C_2 =$ (i i _), (i _ i), (_ i i)

permutation of 2 distinct items at 3 positions nPr

(1 2 _), (1 _ 2), (_ 1 2) | (2 1 _), (2 _ 1), (_ 2 1) } $^3P_2 = 6$

→ Since r =2, it means against each combination there will be r! copies(2!=2) of permuation.

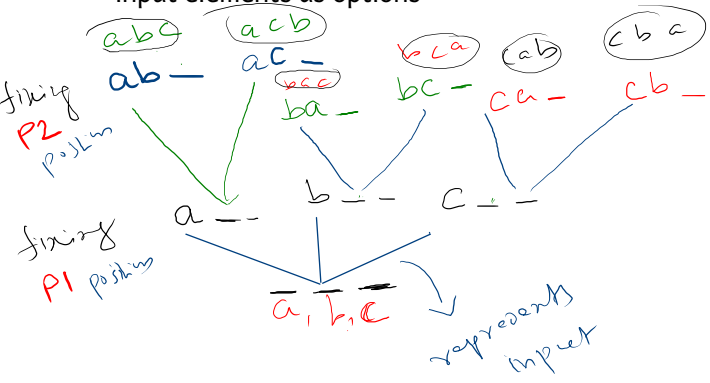
$2^2 \times -$

Relation between Permutation and Combination

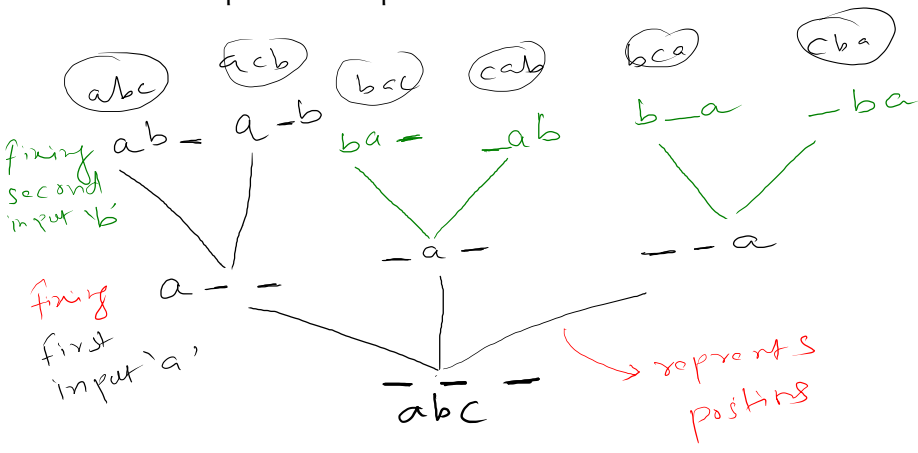
Default approach for permuation tree formation:

1. By fixing the position and taking input elements as options
2. By fixing the input elemnt and taking pisitions as options

1. By fixing the position and taking input elements as options



2.By fixing the input elemnt and taking pisitions as options

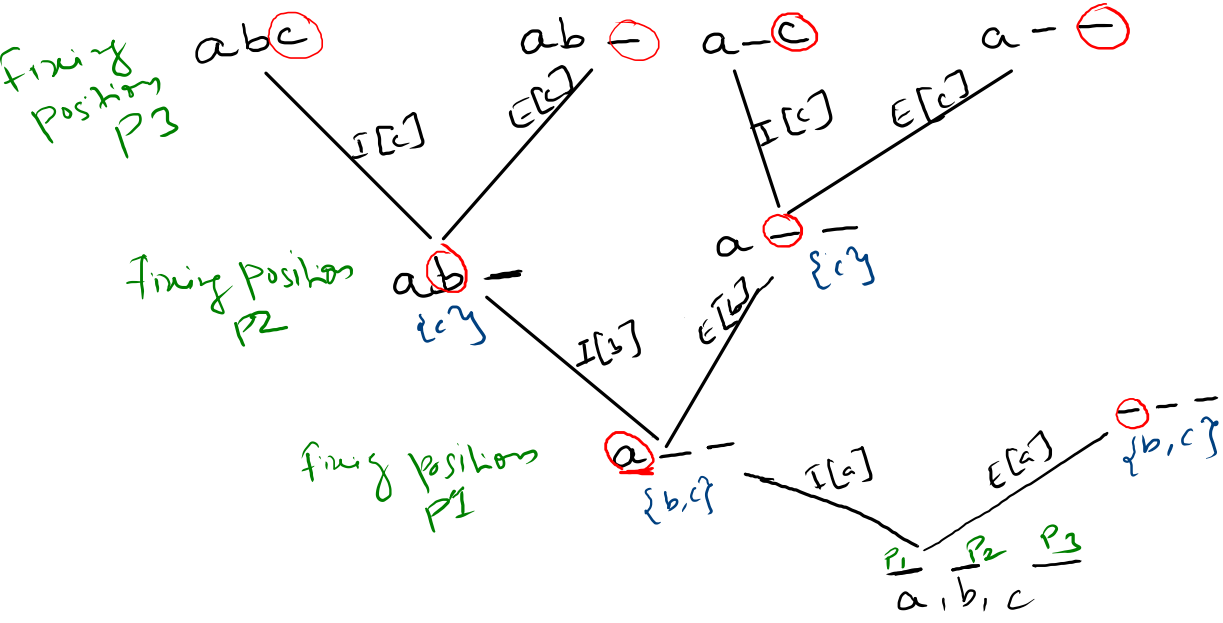


Relation between Permutation and Combination

Default approach for Combination tree formation:

1. Pascal_Identity based Include_Exclude_Tree tree
2. Pascal_Identity_Expansion based Include_Tree

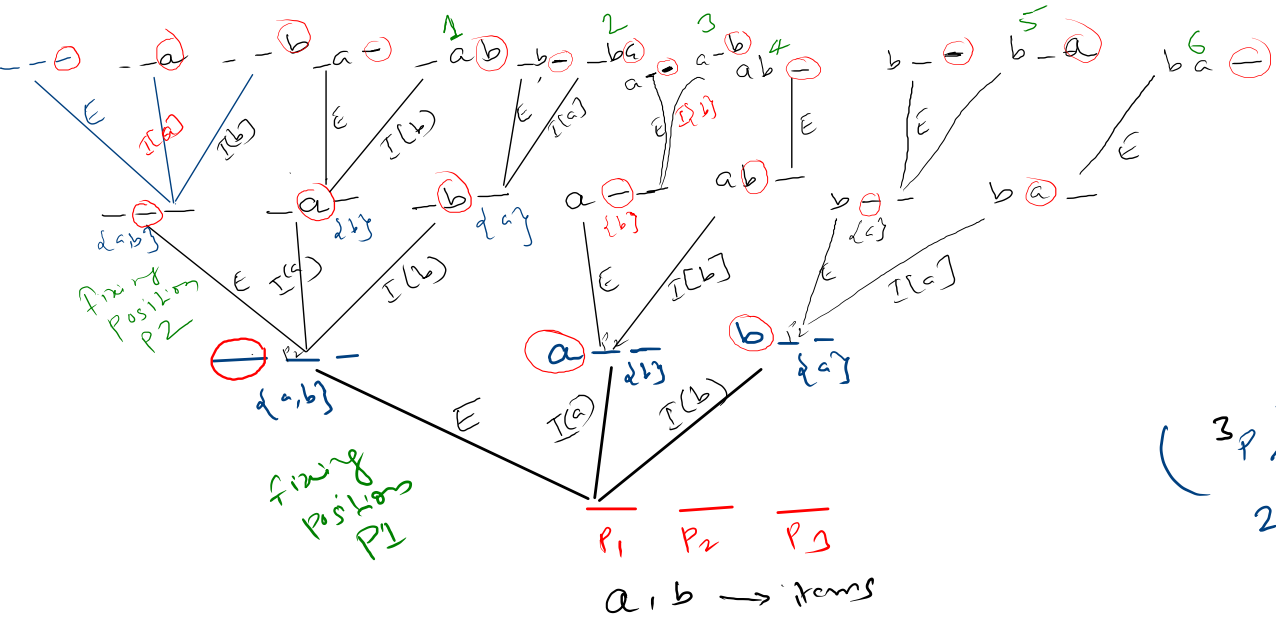
Position fixing using include exclude tree



Relation between Permutation and Combination

Question 1: Print permutation using modified default combination strategy i.e. using modified Include Exclude strategy

target → print ^nP_r using ^nC_r strategy



_ab
_ba
a_b
b_a
ab
ba

$^3P_2 = 6$ (i.e., need to permute 2 items at 3 positions)

Relation between Permutation and Combination

Question 2: Print combination using prermuation strategy of fixing input and taking position as options

Note: If we allow only to place the input in lexicographic order, then we will get combinations from permutation strategy.