

Permutation & Combination

When two tasks are performed in succession, i.e., they are connected by an '**AND**', to find the total number of ways of performing the two tasks, you have to **MULTIPLY** the individual number of ways. When only one of the two tasks is performed, i.e. the tasks are connected by an 'OR', to find the total number of ways of performing the two tasks you have to **ADD** the individual number of ways.

Eg: In a shop there are 'd' doors and 'w' windows.

Case1:If a thief wants to enter via a door or window, he can do it in – (*d+w*) ways.

Case2: If a thief enters via a door and leaves via a window, he can do it in – (d x w) ways.

Linear arrangement of 'r' out of 'n' distinct items (P): The first item in the line can be selected in 'n' ways AND the second in (n - 1) ways AND the third in (n- 2) ways AND so on. So, the total number of ways of arranging 'r' items out of 'n' is

$$(n)(n-1)(n-2)....(n-r+1) = \frac{n!}{(n-r)!}$$

Circular arrangement of 'n' distinct items: Fix the first item and then arrange all the other items linearly with respect to the first item. This can be done in **(n - 1)!** ways.

Concept: In a necklace, it can be done in $\frac{(n-1)!}{2}$ ways

Selection of 'r' items out of 'n' distinct items(ⁿ**C**_r**)**:Arrangement of r items out of n = Select r items out of n and then arrange those r items on r linear positions.

$${}^{n}P_{r} = {}^{n}C_{r} \times r!$$

Dearrangement: If 'n'things are arranged in a row, the number of ways in which they can, be deranged so that none of them occupies its original place is

$$n!\left(\frac{1}{0!} - \frac{1}{1!} + \frac{1}{2!} - \dots + \frac{(-1)^n}{n!}\right)$$

Concept: Number of ways of arranging 'n' items out of which `p' are alike, 'q' are alike, 'r' are alike in a line is given *n*!

by =
$$\overline{p!q!r!}$$

Partitioning

'n' similar items in 'r' distinct groups	No restrictions	^{n+r-1} C _{r-1}
	No group empty	ⁿ⁻¹ C _{r-1}
'n' similar items in 'r' distinct groups	No restrictions	r ⁿ
	Arrangement in a group important	(n+r-1)!
		(r-1)!
'n' similar items in 'r' distinct groups	Listthecasesandthenfindoutinhowmanywaysiseachcasepossible	
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