"Discrete Structures"

Lecture 7

- Chapter 3:-

* Multiplication principle:-

→ If we have n_T of tasks, The first task Could be done by n_1 of ways, The Second one Could be done by n_2 of ways, So All number of Ways to Carry out all tasks is: $n_1 \times n_2 \times \dots n_T$, Keeping in mind that the sequence «Arrangment» is important.

- **Example:** "Application on sets"

If $A = \{a, b, c, d\}$, Find powerset of A using Characteristic Functions

→ $P(A)$: $C = \{a\}$, $B = \{\}$, ... «All possible Subsets of A»

	a	b	c	d
FA	1	1	1	1
FC	1	0	0	0
FB	0	0	0	0
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⟶ Here, We have 4 tasks, Every task Could be done by 2 ways «0 or 1», So number of ways to Carry out all 4 tasks is $2 \times 2 \times 2 \times 2$

Any Task

with repition — «n^r»

without repition. — «nPr»

1) With repitition:- "n^r"

- Example: You have 5 pens and you want to write 3 tasks, So number of permutations is → 5^3

- Example 2: You forgot your password but you know that it consists of 3 letters of this set: $A = \{a, b, c, x, m\}$, So number of Permutations is → 5^3

2) Without repitition:- "nPr" → order is important. ←

- Example: There are 4 persons must carry out 3 tasks, but every person could have only one task, So number of permutations is $nPr = 4P_3$

- Example 2: You forgot your password but You know that it consists of 3 letters of this set: $A = \{a, b, c, x, m\}$ And You are sure that None of these letters is repeated, So number of Permutations is $nPr = 5P_3$

* $nPr = \frac{n!}{(n-r)!}$

Notice that: If you have n of tasks and n of choices, So number of permutations is: $n!$

Example: You have 5 pens and you want to carry out 5 tasks and every pen must carry out only one task, So → $5!$

→ Solve Sheet 3.1 and 3.2