

"Discrete Structures"

* Lecture 7 *

Chapter 3:-

* Multiplication principle:-

→ If we have n_1 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: $n_1 \times n_2 \times \dots \times n_r$, Keeping in mind that the sequence "Arrangement" is important.

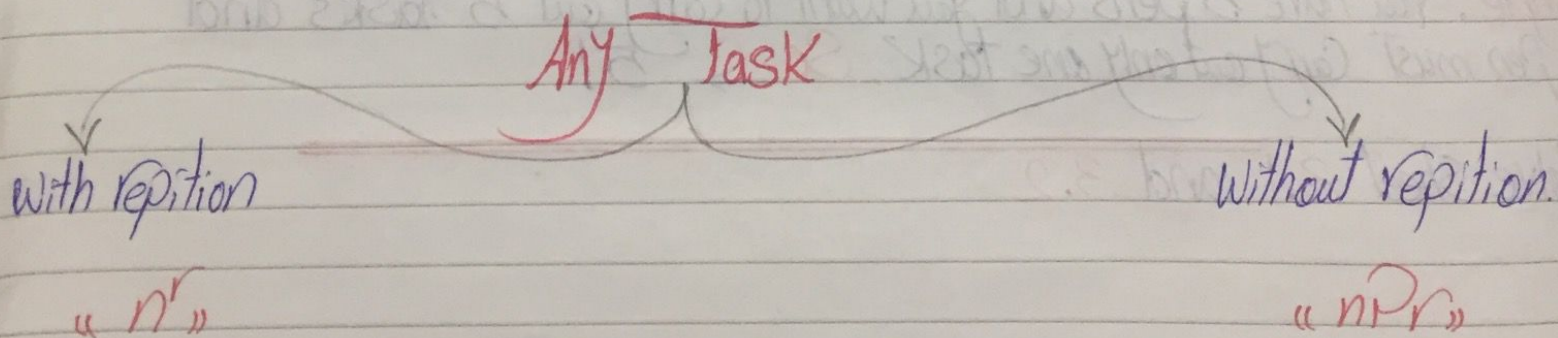
Example: "Application on sets"

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
...				

→ 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 $2 \times 2 \times 2 \times 2$



1) With repetition:- " n^r "

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

- 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 $\rightarrow 5^3$

2) Without repetition:- " nPr " \rightarrow order is important \leftarrow

- 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 $\rightarrow 5!$

Solve Sheet 3.1 and 3.2