MTH 231 LECTURE 18

Division Rule

- If there are n ways to complete a proc from start to finish by first completing subtask 1 in a ways and subtask 2 in b ways, where each of the b ways is redundant, then there are $a = \frac{n}{b}$ unique ways to complete the task

Ex: accc = 4! ways to place A, but 3! ways to put ccc that are redundant. $n = 4!$ ~~b~~

$a = \frac{4!}{3!}$

Ex: How many ways can we arrange aabb

4! ways to arrange all

2! rearranging a, 2! arranging b

$= \frac{4!}{2!2!}$

Ex: How many ways to arrange

1] aaabb $= (5!/2!3!)$
2] aaabcc $= (6!/2!3!)$
3] aabbcc $= (6!/2!2!2!)$
4] aaabbccddd $= (10!/3!3!2!2!)$

multinomial coefficients :)

Permutations

- Permutation is an ordered list of distinct elements. $\{a,b,c,d\}$

- the number of permutations of k objects from n is $P(n,k) = \frac{n!}{(n-k)!}$ $= \frac{n!}{(n-k)!}$

Combinations

- number of combinations of size k from n objects is denoted $C(n,k)$ or $\binom{n}{k} \rightarrow$ n choose k
$= \binom{n}{k} = \frac{n!}{k!(n-k)!}$

Ex: How many 4-card hands are there?

$\binom{52}{4} = \frac{(52 \cdot 51 \cdot 50 \cdot 49)\cancel{48!}}{4!\cancel{(48!)}}$

NOTE $\binom{n}{k} = \binom{n}{n-k}$

NOTE: Also nP_k, nC_k