Math 4740 9/13/23

Ex: In how many ways can 5 people be seated In a row of 5 seats?

5 people Example seatings Ben  $\frac{M}{seat} \xrightarrow{B} \frac{C}{seat} \xrightarrow{S} \frac{S}{seat} \xrightarrow{D} \frac{D}{seat}$ Chris Derick  $\frac{B}{M} \stackrel{C}{\subseteq} \frac{D}{B} \stackrel{S}{\leq}$ Monica Shaq MC

possibilities: Choices Choices Choices Choices Choices seat seat seat seat seat 2345 = 5 | - | 20

EX: Suppose we have 3 math books and 2 biology books. How many ways can we put the books on a shelf so that the math books are next to each other? EPACG Ex: 1////////

Math Bio Fullion Calculus Probability Genetics Algebra



Another way: a unit Thick of math as seperate. and two bio as So, 3 objects. Step 1: Order the 3 objects math E  $\mathcal{G}$ math Math (G)math E Math  $\left[ G \right]$ math 6



Answer =  $6 \cdot 6 = 36$   $\frac{1}{54ep1} \frac{1}{(5+ep2)}$ 

Suppose we have n objects  
where 
$$n_1$$
 of them are alike  
(ie the same or indistinguishable)  
 $n_2$  of them are alike,  
 $\dots$ ,  $n_r$  are alike  
where  $n = n_1 + n_2 + \dots + n_r$   
Then there are  
 $n_1!$   
 $n_1! n_2! \cdots n_r!$   
primutations of these  
objects

EX: How many permutations are there of the letters P a, a, b, cturnula permutations Way aabc  $n_1 = 2 \neq (\#as)$ aacb abac N3=1 + (# c's) acab abca Permutations n = 4 + (tota)acba # permutations: 6 Q Q C caab 4! L aca 21)111 caba  $=\frac{24}{7}=$ bcag Cbag

Combinations Consider a set of size n. The number of subsets of Sizer where OGrén is  $\binom{n}{r} = \frac{n!}{r!(n-r)!} + \binom{look}{spring}$ read: read: n choose r''  $\binom{n}{r} = \frac{n!}{r!(n-r)!} + \binom{look}{spring}$ derivation This is the same as the #

of ways that r objects can be selected/chosen from n'objects while Vorder doesn't matter

Ex; Suppose a dealer has the following cards.  $A^{\circ} A^{\circ} A^{\circ$ many ways can the How deal you two dealer Cands from these four? AP AP E as AP AP order doesn't matter



EX: A dealer has a standard 52 - cand deck. They deal you 5 cards. How many possible hands can you get, Ex hand:  $\left[\begin{array}{c} 0\\ 0\\ \end{array}\right] \left[\begin{array}{c} -2\\ -2\\ \end{array}\right] \left[\begin{array}{c} -2\\ -2$ Royal Flush 1  $\begin{pmatrix} n \\ r \end{pmatrix} = \frac{h!}{r!(n-r)!}$ Answer: 524  $\begin{pmatrix} 52\\ 5 \end{pmatrix}$ 51 (52-5)! 521 5!47!

 $\frac{13}{52.51.50.49.48.47!}$   $\frac{52.51.50.49.48.47!}{5.4.3.2.1}$ = [3.17.)0.49.24= [2, 598, 960]