

Permutations and Combinations

Let X be a finite set with $|X| = n$.

- ① A k -permutation of X is an ordered list of k distinct elements of X .
- ② A k -combination of X is an unordered list of k distinct elements of X .
- ③ A k -permutation with repetition of X is an ordered list of k elements of X .
- ④ A k -combination with repetition of X is an unordered list of k elements of X .

- ① number of k -permutations of $X = P(n, k) = n! / (n-k)! \leftarrow$
- ② number of k -combinations of $X = C(n, k) = \frac{n!}{k!(n-k)!} = \binom{n}{k}$
- ③ number of k -permutations of X with repetition $= n^k$
- ④ number of k -combinations of X with repetition $= ??$

will show $?? = \binom{n+k-1}{n-1} = \frac{(n+k-1)!}{(n-1)!}$