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 $X = P(n,k) = n!/(n-k)!$ ←

② number of k-combinations of $X = C(n,k) = \dfrac{n!}{k!\,(n-k)!} = \binom{n}{k}$

③ number of k-permutations of X with repetition $= n^k$ ←←

④ number of k-combinations of X with repetition $= \binom{n+k-1}{n-1}$

$$= \frac{(n+k-1)!}{(n-1)!\,k!}$$