

Permutations

Selection without Replacement

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Lists and Permutations

- A list of k elements from a set S of n elements
 - Choose k elements **in order**
 - **with replacement** — same element can be chosen again
- A k -permutation on a set S of n elements
 - Choose k elements **in order**
 - **without replacement** — an element cannot be chosen twice

Counting possible permutations

How many different k -permutations exist on an n -set S ?

1.	
2.	
3.	
4.	
⋮	
k	

- You have k slots to fill.
- First slot gives you n options.
- i th slot has $n + 1 - i$ options.
- Use the *Product Principle*

The factorial function

- $n! = 1 \cdot 2 \cdot 3 \cdot \dots \cdot n$
 - $n! = \prod_{i=1}^n i$
- The number of k -permutations on an n -set
 - 1 $N_k = n \cdot (n-1) \cdot (n-2) \cdot \dots \cdot (n+1-k)$
 - 2 $N_k = \prod_{i=n+1-k}^n i$
 - 3 $N_k = \frac{n!}{(n-k)!}$

Exercise

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Consider a deck of 52 cards and five players. Each player is dealt a single card. How many possible deals exist?