

## Classification of Combinatorial problems

### i) Order matters / does not matter

- Choose a committee of 3 out of 10 members (members are distinguishable): the order of the members in committee does not matter

$$C(10, 3) = \frac{10!}{3! \cdot 7!} = \frac{10 \cdot 9 \cdot 8}{3!}$$

- Choose president, vice-president and secretary out of 10 members: three different assignments mean the order is important

$$10 \cdot 9 \cdot 8$$

## ii) identical objects

- **Count different arrangements of 4 objects: AABC**

Modify the problem: **AaBC**

Then we have  $4!=24$  distinguishable arrangements

**For any positions of B and C we have 2 choices, that should not be distinguished.**

**So only  $24/2=12$  arrangements are distinct**

- **Count arrangements of AABB**

$$12/2=6$$

### iii) with/without repetitions

- How many distinct 3-letter passwords exist?  
(order is important  $abc \neq bac$ )

Any letter can be used

only once  
(without repetition)

$$26 \cdot 25 \cdot 24$$

many times  
(with repetition)

$$26^3$$

- You draw 3 balls from a box with 10 red, 10 blue and 10 green  
(order is not important:  $rbg = brg = gbr = \dots$  )

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