Permutation

Combination: order does not matter
Permutation: order matters

Permutation

- Sometimes in our lives we need to select people or something in a certain sequence. How many different ways to form this sequence is a Permutation problem.
- Normally, if we have n positions and m candidates.
- The number of ways P is:
  - $P=(m) \times(m-1) \times(m-2) \times \ldots(m-n)$
  - (Positions are different)

Example

- We can choose 1 person to participate Ping Pang and 1 person to badminton
- Candidates are Tom, Steven and David
- How many choice do we have?

Example

- In this problem, the positions number (n) is 2, the candidates number (m) is 3 so the answer is: P=3×2=6
  - (The same theory as multiple principle last two weeks)

- 3 x 2

Ping Pong

Badminton

Beginner (1)

- Tom’s class has 20 students. Now they are voting for a class monitor and a vice class monitor.

- How many situation can happen?

Beginner (1)

- If there are 15 stations in a railway.

- How many kind of tickets can we make?
  - (from A to B and from B to A count 2)

Advanced (3)

- Use 1, 2, 3, 4, 5 can make: (without repeat digit)
  - How many 3 digit numbers?
  - How many 3 digit numbers with the one is 5?
  - How many 5 digit numbers?

Advanced & Ultimate (1,2,2,5)

- Tom’s family has Tom and his father, mother and 2 sisters. Now they are going to form a line and take a photo of all family member.
  - How many ways can they form this line?
  - If father and mother must stay next to each other, how many ways can they form this line?
  - If two sisters must not stay together, how many ways can they form this line?
  - If there are two chair and 3 positions behind chairs and father and mother must stay next to each other, how many ways can they do?

Homework (1,2,2,3,3,2)

- There are 7 people: A, B, C, D, E, F, G form a line.
  - If A must stand in the middle, how many ways can they do?
  - If A and B must stay together, …?
  - If A and B must not stay together, …?
  - If A, B or C must not stay with each other, …?
  - If A must stand on the left of B, …?
  - If A must not stand on the left end and B must not stand on the right end, …?

- Answer: 720, 1440, 3600, 1440, 2520, 3720

Homework (2,5)

- The school sport meeting is at the corner. In a class, there are five students A, B, C, D, E, they are going to take 1000m, 200m and 100m run (1 position for each). We know that
- If A, B, C cannot do the 1000m, how many ways can they do?
- If A, B, C cannot do the 1000m, E cannot do 100m, how many ways can they do?

- Answer: 24, 21

Thanks