Tips and Tricks

Helpful Permutation and Combination difference with examples.

Description	Permutation	Combination
What is a	Number of Arrangement or Listing of objects	Number of Selections or Grouping of objects
Where to use	If the ordering of objects matters	If the ordering of objects does not matter
Representation	${}^{n}P_{r}$	${}^{n}C_{r}$
	Examples	
In a game of cricket	The number of batting line up of 11 players out of the 15 players	The number of teams consisting of 11 players out of 15 players
In a process of prize distribution	The number of ways of distributing 3 distinct prizes	The number of ways of distributing 3 identical prizes

Relation between permutation and combination:

$${}^{n}P_{r} = {}^{n}C_{r} \times r!.$$

In permutation and combination it is important to understand basic type problems and then being able to apply them on new problems.

To be able to master this you should first try to understand basic problems taught in video lectures in depth. Then try to to solve as many problems as possible, with more problems you will get better idea of concepts

As always try to practice timed tests.

Other realted tips are given in next two pages.

Shortcuts for Permutation and Combination

In how many ways can a word be arranged.

Tricks and Tips on type 1 Question

This is Permutation Question.

Let us take this ahead as an example –

In how many ways can the letters of the word 'LEADER' be arranged?

Count number of Occurances

- L – 1
- E – 2
- A – 1
- D – 1
- R – 1

Total Unique Occurrences – 6(as E repeated 2 times)

Direct Formula = (Unique Occurrences)!/(Each Individual Unique Occurrences)

so = 6!/(1!)(2!)(1!)(1!)(1!) = 360

In how many ways x objects out of a and y objects out of b can be arranged.

Tips and Tricks type 2 problems

Let us take this as well with an example –

Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

Number of ways of selecting (3 consonants out of 7) and (2 vowels out of 4)

$= ({}^7C_3 \times {}^4C_2)$

$= \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{4 \times 3}{2 \times 1}\right)$

= 210.Number of groups, each having 3 consonants and 2 vowels = 210.

Each group contains 5 letters.

Number of ways of arranging
5 letters among themselves = 5!
= 5 x 4 x 3 x 2 x 1
= 120.

Required number of ways = (210 x 120) = 25200.

There are x objects and y objects, a from x has be selected and b from y. How many ways can it be done when N Number of objects from x should always be selected

Tricks and Tips Type 3 Problems

In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

We may have (1 boy and 3 girls) or (2 boys and 2 girls) or (3 boys and 1 girl) or (4 boys).

Required number of ways $= ({}^6C_1 \times {}^4C_3) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_4)$

$= ({}^6C_1 \times {}^4C_1) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) + ({}^6C_2)$

$= (6 \times 4) + \left(\frac{6 \times 5}{2 \times 1} \times \frac{4 \times 3}{2 \times 1}\right) + \left(\frac{6 \times 5 \times 4}{3 \times 2 \times 1} \times 4\right) + \left(\frac{6 \times 5}{2 \times 1}\right)$

$= (24 + 90 + 80 + 15)$

$= 209.$

Coloured Ball Questions

Tricks and Tips Type 4 Problems

A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?

Required number of ways $= ({}^3C_1 \times {}^6C_2) + ({}^3C_2 \times {}^6C_1) + ({}^3C_3)$

$= \left(\frac{3 \times 6 \times 5}{2 \times 1}\right) + \left(\frac{3 \times 2}{2 \times 1} \times 6\right) + 1$

$= (45 + 18 + 1)$

$= 64.$

Circular Combinations Problems

If 6 people are going to sitting at a round table, but Sam will not sit next to Suzie, how many different ways can the group of 6 sit?

Couple of of ways of doing this:

First:
a. Total circular permutations = (6-1)! = 5! = 120.
b. Ways in which Sam and Suzie sit together = 2! * 4! = 2*24 = 48
Required ways = Total – Together = 120 – 48 = 72.

Second:
a. We have total of 6 places. Fix Suzie. Now Sam can’t sit at either seat beside her. So number of places where Sam can sit = 5-2 = 3.
For the other 4 people we can arrange them in 4! ways in 4 seats.
So total ways = 3 * 4! = 72.