

Quantitative Ability - IV

Permutation and combination

Concepts

factorial

$$5! \rightarrow 5! = 5 \times 4 \times 3 \times 2 \times 1$$

$$7! \rightarrow 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1$$

$$108! \rightarrow 108 \times 107 \times 106 \times \dots \times 1$$

$$n \Rightarrow n! = n \times (n-1) \times (n-2) \dots \times 1$$

P&C

7 things (Arrange in a single line)

7! ways

10 things \Rightarrow 10! ways

n things \Rightarrow n! ways

Arrange in a circle



7 things \Rightarrow (7-1)!

\Rightarrow 6! ways

10 things \Rightarrow (10-1)!

\Rightarrow 9! ways

n things \Rightarrow (n-1)! ways

Formula

P & C (C comes before P)

C - just select

P - select & arrange

i) Select (Combination)

ii) Select and Arrange (Permutation)

'n' things in a box out of that we have to select
'r' things

Combination

$${}^n C_r = \frac{n!}{r!(n-r)!}$$

\rightarrow

$$\frac{7!}{5!}$$

D.Z.R.

Permutation

$${}^n P_r = \frac{n!}{r!(n-r)!}$$

arrange Select r
r! (arrange r!)

$${}^n P_n = \frac{n!}{(n-n)!}$$

① In daya's bag there are 3 books of History, 4 books of science and 2 books of Maths. In how many ways can Daya arrange the books so that all the books of same subject are together?

Within group & b/w group

Select & arrange
only arrange
so use normal form

(3H)

(4S)

(2M)

3 groups $\Rightarrow 3!$ ways.

3H \Rightarrow 1 group \Rightarrow $\left. \begin{array}{l} 123 \\ 213 \\ 312 \end{array} \right\} 3!$

4S \Rightarrow 2nd group $\Rightarrow 4!$ ways

2M \Rightarrow 3rd group $\Rightarrow 2!$ ways.

$$3! \times 3! \times 4! \times 2!$$

$$= 3 \times 2 \times 1 \times 3 \times 2 \times 1 \times 4 \times 3 \times 2 \times 1 \times 2 \times 1$$

$$= 6 \times 6 \times 24 \times 2$$

$$= 1728 \text{ ways.}$$

(2) In how many ways can we arrange the word 'FUZZTONE' so that all the vowels come together?

FUZZTONE
3 vowels

3 vowels \Rightarrow 1 group
within themselves $\Rightarrow 3!$ ways

8 alp - 3v = 5 alp.

8/ $\overline{FZZTN} \Rightarrow 5$ alp
 $\Rightarrow 5$ alp + 1 group
 $\Rightarrow 6!$

$\overline{FZZTN} \Rightarrow \frac{6!}{2!} = 3!$

$$3! \times \frac{6!}{2!} = 3 \times 2 \times 1 \times \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1} = 2160 \text{ ways}$$

n things
4 times repeated
 $\frac{n!}{4!}$

⑤ 4 members form a group out of total 8 members.

i) In how many ways it is possible to make the group if two particular members must be included.

ii) In how many ways it is possible to make the group if two particular members must not be included?

Combination problem

Soln

Total = 8 A, B, C, D, E, F, G, H

I) 8 places = 2 places (must) = 2 places remain

$$8 - 2 = 6$$

$${}^6C_2 = \frac{6!}{2!(6-2)!} = \frac{6!}{2!(4!)}$$

$$= \frac{\cancel{6} \times \cancel{5} \times 4 \times \cancel{3} \times 2 \times 1}{2 \times 1}$$

$$= \frac{6 \times 5 \times \cancel{4!}}{2! \times \cancel{4!}} = \frac{6 \times 5}{2 \times 1} = \frac{30}{2} = 15$$

II) 4 place = 2 place (not) = 4 places.

$${}^6C_4 = \frac{6!}{4!(6-4)!} = \frac{6!}{4! \times 2!}$$

$$= \frac{6 \times 5 \times \cancel{4!}}{\cancel{4!} \times 2 \times 1} = \frac{30}{2} = 15$$

④ There are 35 people in a group. There are 12 school girls, 10 school boys, 5 senior citizens and 8 babies in the group. The organizer of the group wants to select a school girl or a school boy as a leader of the group. In how many ways can he do so?

Soln

35 people. \Rightarrow 12 - School girls
 10 - school boys
 5 - senior citizens
 8 - babies

$$12 + 10 \quad n = 22, r = 1 \text{ (select)}$$

$${}^{22}C_1 = \frac{22!}{1!(22-1)!} = \frac{22!}{1! \times 21!} = 22 \text{ //}$$

⑤ In a class, there are 15 students. During a Christmas party all of them shook hands with each other only once. How many handshakes took place in the class?

Soln \checkmark 15 students = n

$${}^{15}C_2 = \frac{15 \times 14 \times 13!}{2! \times 13!} = \frac{15 \times 14}{2} = 105 \text{ //}$$

9) A bank has 6 digit account number with no repetition of digits within a account number - The first and last digit of the account number is fixed to be 4 and 7. How many such account numbers are possible?

~~4~~ 8 1 6 5 2 ~~7~~

$$8 \times 7 \times 6 \times 5 = 56 \times 30 = 1680 \text{ acc. numbers}$$

0, 1, 2, 3, ~~4~~, 5, 6, ~~7~~, 8, 9