

# Aptitude-Permutations-And-Combinations

🔗 For more notes visit

<https://rtpnotes.vercel.app>

## ☰ Reference Playlist

<https://youtube.com/playlist?list=PL8p2I9GkIV454LdGfDOW0KkNazKuA-6B2&feature=shared>

- Aptitude-Permutations-And-Combinations
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## Basic Formula

$$n! = n \times (n - 1) \times \dots \times 3 \times 2 \times 1$$

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

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



## Question 1

Find number of ways to arrange the word WATCH

- No of letters = 5
- No of ways to arrange =  $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$  ways



## Question 2

Find number of ways to arrange the word ENGINEERING

- No of letters = 11
- Letters which are repeating
  - E - 3
  - N - 3
  - G - 2
  - I - 2
  - R - 1
- $11! / 3! \times 3! \times 2! \times 2!$



## Question 3

## Arrange DIGEST, such that Vowels are on the start and end

- Vowels in DIGEST = I and E
- We need to arrange DGST and I,E
  - $DGST = 4!$
  - $IE = 2!$
- When its AND
  - Multiply
- When its OR
  - Add
- Here we need to arrange DGST AND IE
- So multiplying
  - $4! \times 2! = 24$
- 24 Ways of arranging



## Question 4

### Arrange DAUGHTER such that all vowels stay together

- Vowels in DAUGHTER
  - A,U,E
- Consonants in DAUGHTER
  - DGHTR
- A,U and E should be together
  - Consider it as one object
- DGHTR(Vowels)
  - There are 6 letters to arrange(Considering Vowels as one letter)
  - $6!$  ways to arrange
- AUE
  - $3!$  ways to arrange
- Total arrangements =  $6! \times 3!$



## Question 5

Arrange DAUGHTER such that all vowels should never be together

- Subtract Arrangements of DGHTR(Vowels) from no of arrangements in DAUGHTER
- $8! - 6! \times 3! = 40320 - 4320 = 36000$



## Question 6

In how many ways a committee of 6 members be selected from 7 men and 5 ladies, consisting of 4 men and 2 ladies

- We need to select 4 from 7 men
  - $\Rightarrow {}^7C_4$
- We need to select 2 from 5 ladies
  - $\Rightarrow {}^5C_2$
- Consisting of 4 men **AND** 2 ladies
  - Since its AND, we need to multiply
- $\Rightarrow {}^7C_4 \times {}^5C_2 = 350$



## Question 6

A Box contains 2 white, 3 black and 4 red balls. In how many ways can 3 balls be drawn from the box if atleast 1 black ball is to be included in the draw

2 White balls

3 Black balls

4 Red balls

Three balls are drawn

Total possible combination

$$\Rightarrow {}^9P_3$$

Combination without black

$$\Rightarrow {}^2C_2 \times {}^4C_1 + {}^2C_1 \times {}^4C_2 + {}^4C_3$$

The combination with atleast one black

$$\Rightarrow \frac{9 \times 8 \times 7}{3 \times 2 \times 1} - [1 \times 4 + 2 \times \frac{12}{2} + 4]$$

$$\Rightarrow 12(7) - [20]$$

$$\Rightarrow 84 - 20 = 64$$

64 Combination include atleast one black

Hence the correct answer is 64



## Question 7

In an examination there are three multiple choice questions and each question has 4 choices. The number of ways in which a student can fail to get all answers correct is

Since each question has 4 options

i.e there are 4 choices or 4 ways to answer a question

$\therefore$  Number of ways to answer 3 questions is  $4 \times 4 \times 4 = 64$

Out of 64 ways, there is only one way which has all the answer correct.

So, number of ways in which a student fails to get all answer correct is  $64 - 1 = 63$  ways.



## Question 8

A committee of 5 members is to be formed out of 3 trainees, 4 professors and 6 research associates. In how many different ways can this be done, if the committee should have 4

professors and 1 research associate or all 3 trainees and 2 professor

Five members team with 4 professors and 1 research associate can be selected in

$$= {}^4C_4 \times {}^6C_1 = 1 \times 6 = 6 \text{ ways}$$

Five members team with 3 trainees and 2 professors can be selected

$$\text{in} = {}^3C_2 \times {}^4C_2 = 1 \times 6 = 6 \text{ ways}$$

Total number of required ways = 6 + 6 = 12



## Question 9

In how many different ways can the letters of the word 'DIRECTOR' be arranged so that the vowels are always together?

D I R E C T O R  $\Rightarrow$  5 consonants (D, R, C, T, R - 2 R's)

$\Rightarrow$  3 vowels

— — — — — — — — = 1 set

$$\text{Arrangement} = \frac{6! \cdot 3!}{2!}$$

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

$$= 6 \times 6 \times 20 \times 3$$

$$= 36 \times 60 = 2160$$



## Question 10

Out of 5 women and 4 men, a committee of three members is to be formed in such a way that at least one member is a woman. In how many different ways can it be done?

If there are no restrictions, 3 members are to be selected from 9 people.

so  ${}^9C_3 \Rightarrow 84$

The number of ways of selecting all 3 members being men only from 4 men

$= {}^4C_3 = 4$

$\Rightarrow \text{answer} = 84 - 4 = 80$



## Question 11

There are 6 teachers. Out of them two are primary teachers, two are middle teachers and two are secondary teachers. They are to stand in a row, so as the primary teachers, middle teachers and secondary teachers are always in a set. The number of ways in which they can do so is?

There are 2 primary teacher.

They can stand in a row in  $P(2, 2) = 2! = 2 \times 1$  ways = 2 ways.

There are 2 secondary teachers. They can stand in row in

$P(2, 2) = 2! = 2 \times 1$  ways = 2 ways.

These three sets can be arranged in themselves in

$3! = 3 \times 2 \times 1 = 6$  ways.

Hence the required number of ways  $2 \times 2 \times 2 \times 6 = 48$ .



## Question 12

In how many ways can a cricket eleven be chosen out of 14 players?

- ${}^{14}C_{11}$