

# Permutation and Combination

## Permutation and Combination



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Placement for All.. All for Placement

This Video Completely covers the problems on "Permutation and combination" which is more than sufficient for all kind of placement Exams eg: TCS/WIPRO/AMCAT/ELITMUS/CoCubes and all other placement Exams.

"Permutation and combination" by : Pratik Shrivastava (10 years of industry experience and awarded best Aptitude trainer)

## Permutation and Combination

Permutation is an arrangement of a group of objects where the order does matter.

Combination is selection where order does not matter.

Let's Understand this by few Examples.

- Let's say, I have to choose an alphabet. In how many ways can I chose?

The ans is 26 ways, because there are 26 alphabets.

- Okay. In how many ways can I chose a vowel?

The ans is 5 ways, because there are 5 vowels only.

- Okay. In how many ways can I chose a consonant?

The ans is 21 ways, because there are 21 consonants only.

## Permutation and Combination (P & C) ✓

→ Permutation is an arrangement of a group of objects where the order does matter. ]

→ Combination is selection, where order does not matter.

Let's Understand this by few Examples. ]

eg: SM 4w  
2M 3W

MONDAY → Meaning  
NM ODAY → x Meaning  
less word

- ✓ Let's say, I have to choose an alphabet. In how many ways can I chose?

The ans is 26 ways, because there are 26 alphabets.

- ✓ Okay. In how many ways can I chose a vowel?

The ans is 5 ways, because there are 5 vowels only.

A, E, I, O, U

permutation  
A B C D ... 24

- ✓ Okay. In how many ways can I chose a consonant?

The ans is 21 ways, because there are 21 consonants only.

21 Consonant

## Permutation and Combination

The formula of permutations of 'n' different things taken 'r' at a time is

$${}_nP_r = n! / (n-r)!$$

Means to say, if we have 3 letters

(A, B, C) and we take 2 letters

(like AB, AC, etc.) at a time ==>

$$\text{ways} = {}_3P_2 = 3! / (3-2)! = 3! / 1! = 6 \text{ ways}$$

We can make AB, AC, BA, BC, CA, CB = 6 ways.

**This is called permutation.**

$${}_nC_r = n! / r! * (n-r)!$$

## Permutation and Combination

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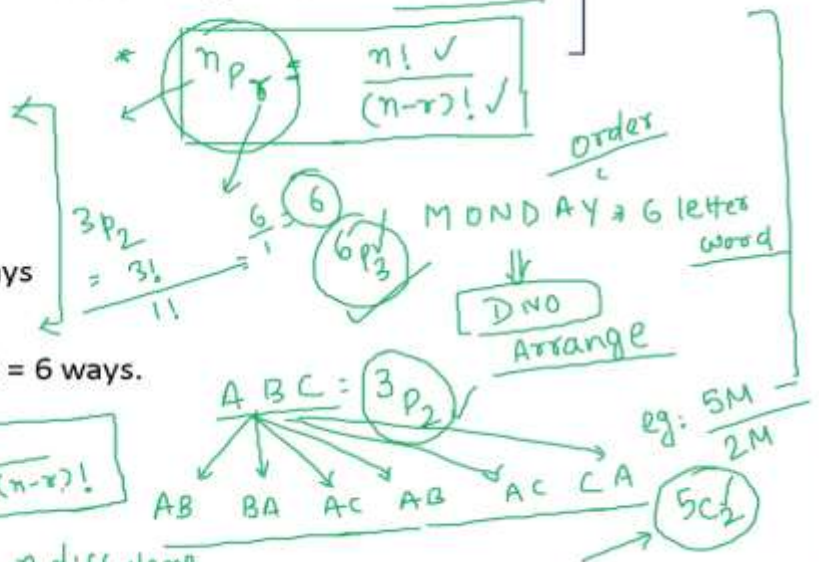
We can make AB, AC, BA, BC, CA, CB = 6 ways.

**This is called permutation.**

$${}_nC_r = n! / r! * (n-r)!$$

$${}_nC_r = \frac{n!}{r! * (n-r)!}$$

selection of r items out of n diff items.



## Permutation and Combination

**Know About Factorials:**

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

$$5! = 5 * 4 * 3 * 2 * 1 = 120$$

Below factorials need to keep in mind:

$$0! = 1 \quad 7! = 5040$$

$$1! = 1 \quad 8! = 40320$$

$$2! = 2$$

$$3! = 6$$

$$4! = 24$$

$$5! = 120$$

$$6! = 720$$

## Permutation and Combination

Let us practice some problems based on  $nPr$  and  $nCr$ .

$$\textcircled{1} \quad {}^6P_2 = \frac{6!}{(6-2)!} = \frac{6!}{4!}$$

$$\Rightarrow \frac{6 \times 5 \times \cancel{4 \times 3 \times 2 \times 1}}{4!} \checkmark$$

$$\Rightarrow \frac{6 \times 5 \times \cancel{4!}}{4!} = \textcircled{30}$$

$$\textcircled{2} \quad {}^7P_3 = \frac{7!}{(7-3)!} = \frac{7!}{4!} \checkmark$$

$$= \frac{7 \times 6 \times 5 \times \cancel{4!}}{4!}$$

$$= \textcircled{210}$$

$$\textcircled{3} \quad {}^{10}C_3 = \frac{10!}{3! \times (10-3)!} = \frac{10!}{3! \times 7!}$$

$$= \frac{10 \times 9 \times 8 \times \cancel{7!}}{3 \times 2 \times 1 \times \cancel{7!}}$$

$$= \textcircled{120} \checkmark$$

$$\textcircled{4} \quad {}^8C_2 = \frac{8!}{2! \times (8-2)!} = \frac{8!}{2! \times 6!}$$

$$= \frac{8 \times 7 \times \cancel{6!}}{2 \times \cancel{6!}}$$

$$= \textcircled{28} \checkmark$$

## Permutation and Combination

Q1: In how many ways the letters of the word MONEY can be arranged?

A. 120 B. 720 C. 24 D. 6! E. None of these

5 letter word [MONEY]

$$\textcircled{1} \quad {}^5P_5 = \frac{n!}{(n-r)!}$$

$$\Rightarrow \frac{5!}{(5-5)!} = \frac{120}{0!} = \frac{120}{1} = 120$$

MONEY  
OMNEY  
MONCY  
ENOMY  
YNOM

2 method

✓ MONEY ✓  
5 letters are different  
 $\Rightarrow 5! = 120 \checkmark$

M				
↑	↑	↑	↑	↑
5	4	3	2	1

$$5 \times 4 \times 3 \times 2 \times 1 = 120$$

## Permutation and Combination

Q2: In how many ways can the letters of the word "PROBLEM" be rearranged to make 7 letter words such that none of the letters repeat?

A. 7! B. 7C7 C. 77 D. 49 E. None of these

PRATIK ✓  
6 letters are dist

Ans:  $\checkmark 7!$  or  $5040 \checkmark$

PROBLEM ✓  
7 letter are distinct ✓

$\frac{6!}{720 \text{ ways}}$



### Permutation and Combination

Q3: In how many ways can the letters of the word 'LEADER' be arranged?

- a) 72   b) 144   c) 360   d) 720   e) None of these

Solution:

LEADER

LEADER

[L E A D E R]

6 letters are distinct

$$= \frac{6!}{2!}$$

$$= \frac{720}{2} = 360$$

[RUN NUR]

### Permutation and Combination

Q4: In how many different ways can the letters of the word 'MATHEMATICS' can be arranged?

- A.  $11!/2! \times 2! \times 2!$    B.  $11!/8!$    C. 77   D. 49   E. None of these

Solution:

M A T H E M A T I C S

11 letters are not distinct

$2! \times 2! \times 2! = 8!$

$2 \times 2 \times 2 = 8$

$$= \frac{11!}{2! \times 2! \times 2!}$$

$$= \frac{11!}{8}$$

### Permutation and Combination

Q5: In how many ways the letters of the word RAINBOW can be arranged so that all the words begin with R?

- A. 120   B. 720   C. 5040   D. 24   E. None of these

R R R R R R R

RAINBOW (7 letter word)

R . . . . .

1

6 letters distinct

$1 \times 6! = 720$

R I . . . . .

1 6 5 4 3 2 1

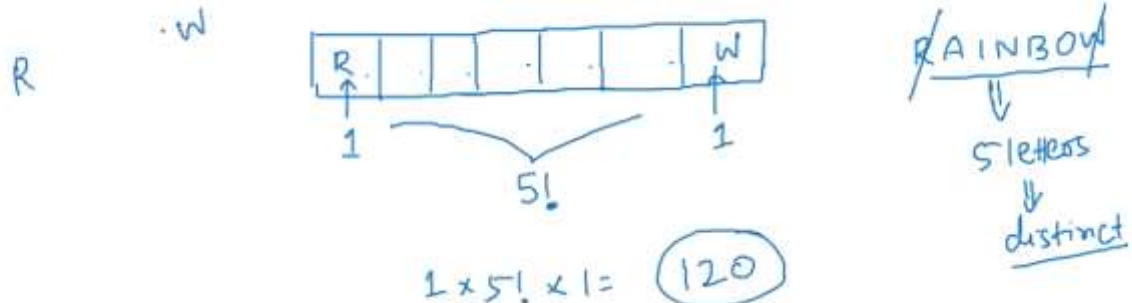
7 letters / 7 boxes

$1 \times 6! = 720$  words

## Permutation and Combination

Q6: In how many ways the letters of the word RAINBOW can be arranged so that all the words begin with R and ends with W?

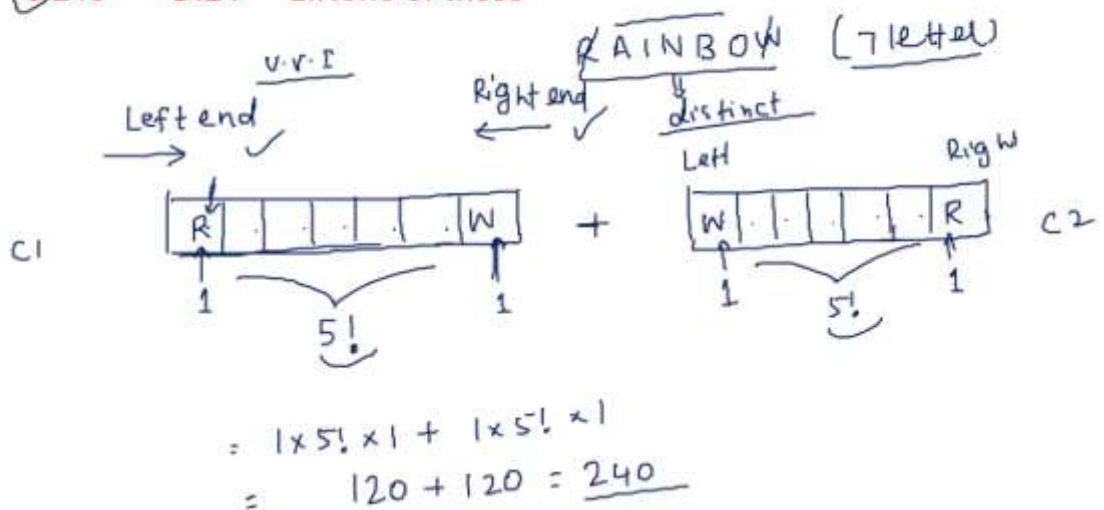
- A.120 B.720 C.5040 D.24 E.None of these



## Permutation and Combination

Q7: In how many ways letter of the word RAINBOW can be arranged so that R and W are at the end positions?

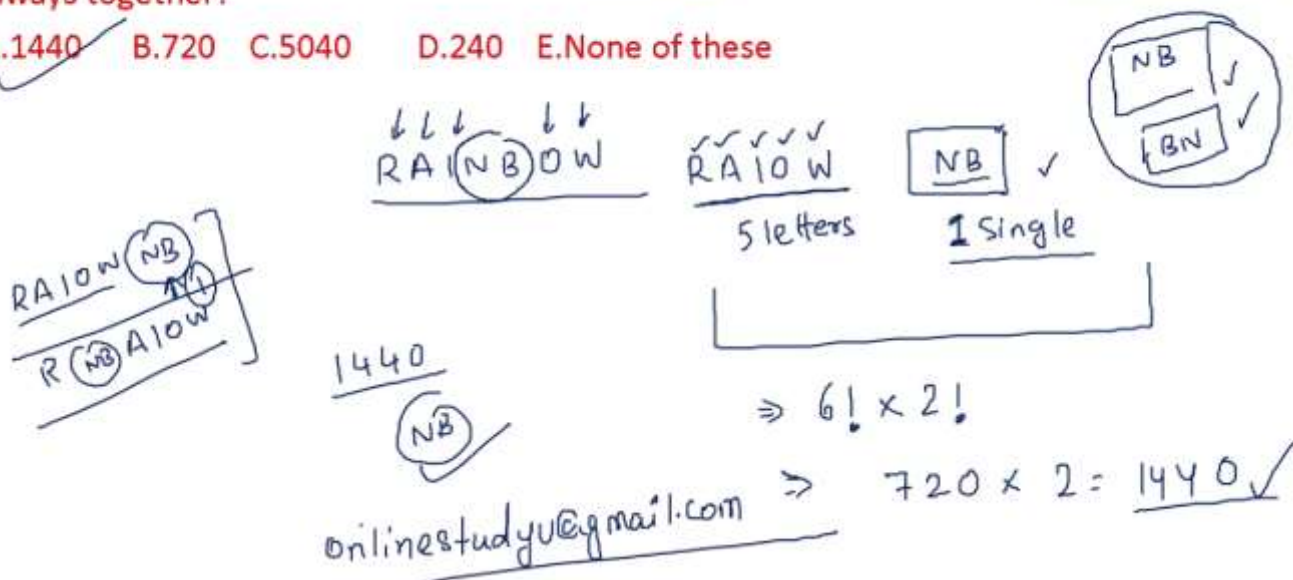
- A.120 B.720 C.240 D.24 E.None of these



## Permutation and Combination

Q8: In how many ways letter of the word RAINBOW can be arranged so that N and B are always together?

- A.1440 B.720 C.5040 D.240 E.None of these





## Permutation and Combination

Q9: In how many ways letter of the word RAINBOW can be arranged so that I and O are never together?

- A.1440 B.3500 C.5040 D.2240 E. None of these (3600)

\* first, When I & O are together,

Total words - (I & O) are together.

When I & O are together, RAINBOW  $\Rightarrow$  RANBW IO  
 $\Rightarrow$  5 single

Total = RAINBOW =  $7! = 5040$   $\Rightarrow 6! \times 2!$

When I & O are not together.

$5040 - 1440 = 3600$   $\Rightarrow 720 \times 2 = 1440$  ]  $\checkmark$

## Permutation and Combination

Q10: In how many ways letter of the word RAINBOW can be arranged so that vowels are always before consonants?

- A.144 B.720 C.240 D.120 E. None of these

144 words

RAINBOW

vowel

O I A

"OIA" "RNBW"

$1 \times 3! \times 4! = 6 \times 24 = 144$

1 way (vowel before constant)

3 vowels =  $3!$

4 cons =  $4! \checkmark$

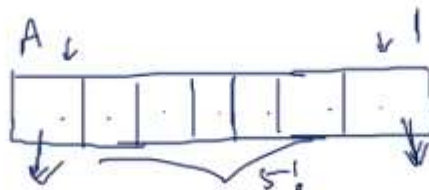
## Permutation and Combination

Q11: In how many ways letter of the word RAINBOW can be arranged so that first and last letters are vowels?

- A.144 B.720 C.240 D.120 E. None of these

RAINBOW

IAO RNBW



$\Rightarrow 3P_2 \times 5!$   
 $\Rightarrow 120 \times 6 = 720$

words

$3P_2 = \frac{3!}{(3-2)!} = \frac{6}{1} = 6$

npv

## Permutation and Combination

Q12: In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?

a)810   b)1440   c)2880   ~~d)50400~~   e)None

## Permutation and Combination

Q13. In how many ways letter of the word RAINBOW can be arranged so that the vowels are never together?

A.1440 B.3600 C.2400 D.5040 E.None of these

A.1440 B.3600 C.2400 D.5040 E.None of these

V.V.I ✓

R A I N B O W (7 letters)

7 Positions

RNBWAIO (9)

[C C C C C]

S.P.<sub>3</sub> =  $\frac{5!}{(5-3)!}$

5P<sub>3</sub> × (4!) ⇒  $\frac{120}{2} \times 24 > 1440$  ✓

I.O.

## Permutation and Combination

Q14: In how many different ways can the letters of the word MATHEMATICS be arranged so that the vowels always come together?

A.10080 B. 4989600 C. 120960 D. None of these

M A T H E M A T I C S

↓ ↓ ↓ ↓

M T H M T C S      A E A I

7      1 single box

$8! \times 4!$

$2! \times 2! \times 2!$

$\Rightarrow 2^2 \times 8! \times 24^3$

$\frac{8! \times 24^3}{8}$

$40320 \times 3 = 120960$



### Permutation and Combination

Q15: How many 4-letter words with or without meaning, can be formed out of the letters of the word, LOGARITHMS; if repetition of letters is not allowed?

A.40 B.400 C.5040 D.2520

✓ LOGARITHMS  $\Rightarrow$  10 letter word

$\Rightarrow {}^{10}P_4$

$$10 \times 9 \times 8 \times 7 = 5040$$

$$\Rightarrow \frac{10!}{(10-4)!} = \frac{10!}{6!} = \frac{10 \times 9 \times 8 \times 7 \times 6!}{6!} = 5040$$

### Permutation and Combination

Q16: How many 3-digit numbers can be formed from the digits 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?

A.5 B.10 C.15 D.20 E.None of these

[2, 3, 5, 6, 7, 9]

Numbers  
5  
0 or 5 ✓

5	4	1
---	---	---

$$5 \times 4 \times 1 = 20$$

### Permutation and Combination

Q17: How many 4-digit numbers can be formed from the digits 0, 2, 3, 5, 6, 7 and 9, which are divisible by 5 and none of the digits is repeated?

A.5 B.10 C.15 D.220

0, 2, 3, 5, 6, 7, 9

50 ✓  
5

0, 2, 3, 5, 6, 7, 9

V.V.S

CI

5	5	4	1
---	---	---	---

6	5	4	1
---	---	---	---

$$= 5 \times 5 \times 4 \times 1 + 6 \times 5 \times 4 \times 1$$

$$= 100 + 120$$

$$= 220 \text{ Numbers } \checkmark$$

$$\begin{array}{r} 0325 \\ \times \times \\ \hline 3025 \end{array}$$



### Permutation and Combination

Q18. All the letters of the word "LUCKNOW" are arranged in all possible ways, what will be Rank of the word "LUCKNOW".

a)1221 b)1821 c)1921 d)None

LUCKNOW

Many times  
MOTHER

Dictionary

Customised

Dictionary

Alphabetical

LUCKNOW

1921

$\checkmark C \text{ --- } \text{--- } \text{--- } \text{--- } \text{--- } \Rightarrow 6! = 720 \checkmark$   
 $\checkmark K \text{ --- } \text{--- } \text{--- } \text{--- } \text{--- } \Rightarrow 6! = 720 \checkmark$   
 $\checkmark LC \text{ --- } \text{--- } \text{--- } \text{--- } \text{--- } \Rightarrow 5! = 120 \checkmark$   
 $\checkmark LK \text{ --- } \text{--- } \text{--- } \text{--- } \text{--- } \Rightarrow 5! = 120 \checkmark$   
 $\checkmark LN \text{ --- } \text{--- } \text{--- } \text{--- } \text{--- } = 5! = 120$   
 $\checkmark LQ \text{ --- } \text{--- } \text{--- } \text{--- } \text{--- } = 5! = 120$

### Permutation and Combination

Q19. If 2 boys and 2 girls are to be arranged in a row so that the girls are not next to each other, how many possible arrangement are there.

1)10 2)12 C)15 D)24

$B_1, B_2, G_1, G_2 \checkmark$

Total no of arrangement =  $4! = 24 \checkmark$

When Girls sit together  $\Rightarrow$   
 $\underline{12}$

Girls does not sit together =  $24 - 12 = 12$

$G_1 G_2 \checkmark$

$B_1, B_2$   $G_1, G_2$   
 $2$   $1$  single  
 $3! \times 2!$   
 $= 6 \times 2 = 12$

### Permutation and Combination

Q21. A committee of 5 persons is to be formed from 6 men and 4 women. In how many ways can this be done when at least 2 women are included ?.

1)196 2)186 C)190 D)200

6M 4W

5 person

$\Rightarrow 2W \times 3M + 3W \times 2M + 4W \times 1M$

$\Rightarrow 4C_2 \times 6C_3 + 4C_3 \times 6C_2 + 4C_4 \times 6C_1$

$\Rightarrow 6 \times 20 + 4 \times 15 + 1 \times 6$

$\Rightarrow 120 + 60 + 6 = 180 + 6 = 186$

$6C_3$   
 $\frac{6!}{3! \times 3!}$   
 $\frac{720}{36}$   
 $20$   
 $4C_2$   
 $\frac{4!}{2! \times 2!}$   
 $\frac{24}{4}$   
 $6$   
 $20 + 6 = 26$   
 $4C_3$   
 $\frac{4!}{3! \times 1!}$   
 $\frac{24}{6}$   
 $4$   
 $26 + 4 = 30$

### Permutation and Combination

Q22. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

1) 25200 2) 52000 C) 120 D) 24400

$$7! / (3! \times 4!) \\ 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 / 6 \times 4 \times 3 \times 2 \times 1 \\ 12 \times 21 \\ 12 \times (20+1) \\ 240+12 \\ 252$$

$$7C_3 \times 4C_2 \times 5! \\ 35 \times 6 \times 120 \\ 210 \times 120 \\ 25200$$

very good

PSC

arrangement  
formation  
permutation

5 words  
3C + 2C

### Permutation and Combination

Q23. Find the total numbers that can be made using the letters 0,2,4,3,5 which are greater than 6000 without repeating the digits?.

1) 92 2) 104 C) 96 D) 98 E) 10

5-digit no

$$5, 4, 3, 2, 1 \\ 0, 2, 3, 4 \\ \begin{array}{|c|c|c|c|c|} \hline & & & & \\ \hline \end{array} \\ \begin{array}{c} \uparrow \uparrow \uparrow \uparrow \uparrow \\ 4 \quad 4 \quad 3 \quad 2 \quad 1 \end{array} \\ = 4 \times 4 \times 3 \times 2 \times 1 \\ = 96$$

$$\begin{array}{r} > 6000 \\ 50432 \times \\ \hline 05432 \times \\ \hline \end{array} \\ \begin{array}{l} 4 \text{ digit} \\ < 6000 \end{array}$$

### Permutation and Combination

Q24. How many 6 digits even numbers can be formed from the digits 1,2,3,4,5,6 and 7 so that digit should not be repeated and the second last digit is even?

1) 6489 2) 320 C) 2160 D) 720

TCS Exam

2

$$\begin{array}{|c|c|c|c|c|c|} \hline . & . & . & . & 4 & 6 \\ \hline \end{array} \\ \begin{array}{c} \uparrow \uparrow \uparrow \uparrow \uparrow \uparrow \\ 5 \quad 4 \quad 3 \quad 2 \quad 2 \quad 3 \end{array} \\ 5 \times 4 \times 3 \times 2 \times 2 \times 3$$

$$\begin{array}{|c|c|c|c|c|c|} \hline 1 & 2 & 3 & 4 & 5 & 6 & 7 \\ \hline \end{array}$$

720 Number  
① even  
② second last

$$5 \times 4 \times 3 \times 2 \times 2 \times 3 \\ 720$$