



Permutation and Combination

Module-5

Permutation

Word Problems

Simple and Easy Method



INDIA

Recap

Fundamental Principle of Counting states that

“If an event can occur in m different ways , following which another event can occur in n different ways, then the total number of occurrence of the events in the given order is $m \times n$.”

The notation ‘ $n!$ ’ represents the product of first n natural numbers

A Permutation is an arrangement in a definite order of number of objects taken some or all at a time

For a natural number ‘ n ’
 $n! = n(n-1)!$
 $= n(n-1)(n-2)!$
 $= n(n-1)(n-2)(n-3)!$
.....

Important results

$${}^n P_n = n!$$

$${}^n P_1 = n$$

$${}^n P_0 = 1$$

Permutations when all the objects are distinct



Permutations when all the objects are not distinct

Theorem 1

The number of permutation of n different objects taken r at a time, where $0 < r \leq n$ and the objects do not repeat is

$${}^n P_r$$

Theorem 2

The number of Permutations of n different objects taken r at a time, when repetition is allowed

$$\text{is } n^r$$

Theorem 3

The number of permutations of n objects, where p objects are of the same kind and the rest are all different = $\frac{n!}{p!}$

Theorem 4

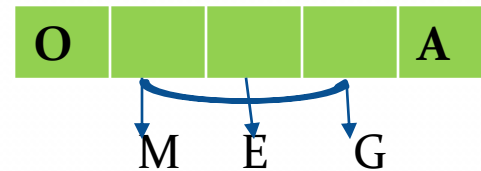
The number of permutations of n objects, where p_1 objects are of one kind, p_2 are of second kind, ..., p_k are of k^{th} kind and the rest, if any are of different kind is $\frac{n!}{p_1! p_2! \dots p_k!}$



QUESTION.....

- How many words can be formed from the letters of the word OMEGA if:

(i) O and A occupy end places.



M, E, G \longrightarrow can be arranged in $3!$ ways.

O & A \longrightarrow can be arranged in $2!$ ways.

\therefore Total no. of arrangements = $3! \times 2! = 12$

(ii) E being always in the middle.

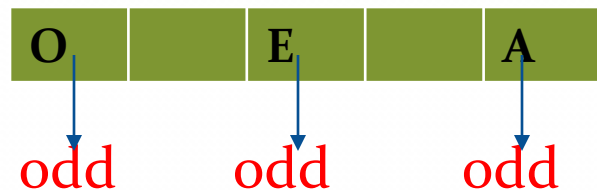


O, M, G, A \longrightarrow can be arranged in $4!$ ways.

\therefore Total no. of arrangements = $4! = 24$

Question continued.....

(iii) Vowels occupy odd places



Vowels – A, E, O can be arranged in $3!$ ways.
Consonants – M, G can be arranged in $2!$ ways.
 \therefore Total no. of arrangements
 $= 3! \times 2! = 12$

(iv) Vowels never occur together



Total no. of words $= 5! = 120$
When vowels are together,
no. of words $= 3! \times 3! = 36$
 \therefore Total no. of words when
the vowels are never
together $= 120 - 36 = 84$



Poll



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

Find the number of words with or without meaning which can be made using all the letters of the word AGAIN .If these words are written as in a dictionary , what will be the 50th word?

Solution There are **5** letters in the word **AGAIN**, in which **A** appears **2** times. Therefore, the required number of words = $\frac{5!}{2!} = 60$

To get the number of words starting with A, we fix the letter A at the extreme left

position, we then rearrange the remaining 4 letters taken all at a time. There will be as many arrangements of these 4 letters taken 4 at a time as there are permutations of 4 different things taken 4 at a time. Hence, the number of words starting with

A = $4! = 24$. Then, starting with **G**, the number of words = $\frac{4!}{2!} =$

12 as after placing G

at the extreme left position, we are left with the letters A, A, I and N. Similarly, there

are **12** words starting with the next letter **I**. Total number of words so far obtained

= $24 + 12 + 12 = 48$.

The **49th** word is **NAAGI** The **50th** word is **NAAIG**



$$4! = 24.$$



$$\frac{4!}{2!} = 12$$



$$\frac{4!}{2!} = 12$$

$$\text{TOTAL} = 24 + 12 + 12 = 48$$

WHAT'S 49TH = N - - - -

THEN 50TH = N - - - -

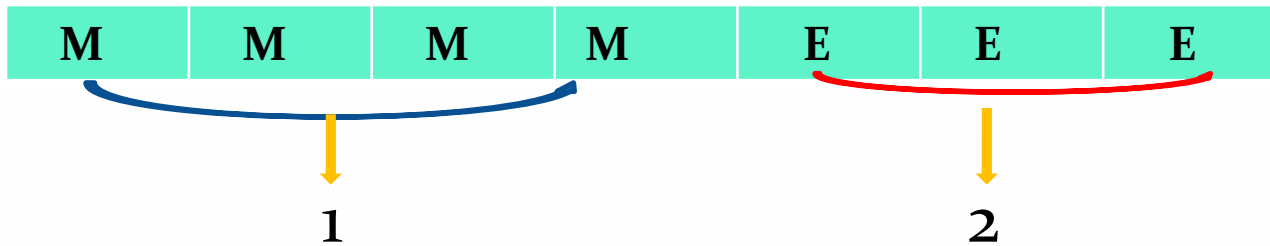
Letters of the word 'MOTHER' are arranged in all possible ways and the words so obtained are arranged as in a dictionary. What is the rank of the word 'MOTHER' in this arrangement?

Initial Letters	Number of words
E _ _ _ _ _	$5! = 120$
H _ _ _ _ _	$5! = 120$
M E _ _ _ _	$4! = 24$
M H _ _ _ _	$4! = 24$
M O E _ _ _	$3! = 6$
M O H _ _ _	$3! = 6$
M O R _ _ _	$3! = 6$
M O T E _ _	$2! = 2$
total	308 words

After this, the 309th word is MOTHER.

In how many ways can 4 books on Mathematics and 3 books on English be placed on a shelf so that books of the same subject always remain together?

- Mathematics \rightarrow 4 and English \rightarrow 3



Required no. of arrangements = $4! \times 3! \times 2! = 288$

POLL QUESTION.....



In a class, there are 4 girls and 6 boys. In how many ways can they be seated in a row so that all the four girls are not together?

(A) $10! - 7! \times 4!$

(B) ${}^{10}P_4$

(C) 7P_4

(D) $6! \times 4!$

ASSIGNMENT

1	How many words can be formed out of the letters of the word 'TRIANGLE'? How many of these will begin with T and end with E?
2	How many 6-digit numbers can be formed from the digits 0, 1, 3, 5, 7 and 9 which are divisible by 10 and no digit is repeated?
3	Find the number of different permutations of the letters of the word BANANA.
4	How many numbers greater than 1000000 can be formed by using the digits 1, 2, 0, 2, 4, 2, 4?
5	Letters of the word 'MOTHER' are arranged in all possible ways and the words (with or without meaning) so obtained are arranged as in a dictionary. What is the position of the word 'MOTHER' in this arrangement?
ANSWERS;(1) $8! = 40320$ and $6! = 720$ (2) 120 (3) $\frac{6!}{3!2!} = 60$ (4) 360 (5) 309 th	

THANK YOU

Stay safe



Stay blessed