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Permutations and Combinations

- **Fundamental Principle of Counting**
  If an event can occur in m ways, and the second event can occur in n ways, then the both the events together can occur in mxn ways.

- **Permutations**

  An arrangement of objects in a particular order is known as permutation. The Total number of permutation of n objects is $n(n-1)\ldots\ldots\ldots\ldots.2.1$
  Hence $n! = n(n-1)(n-2)\ldots\ldots\ldots.1$
  $n!$ or n read as n Factorial.

- **Permutation of r objects out of n objects**

  The number of permutations of r objects out of n objects is usually denoted as $np_r = \frac{n!}{(n-r)!}$

- **Combinations**
  (i) The number of ways of selecting r objects out of n objects is : $nc_r = \frac{n!}{r!(n-r)!}$
  (ii) $nc_r = nc_{n-r}$
  (iii) The value of $nc_o = 1$

Check yourself

Q1 How many multiples of 5 are there from 10 to 95?
(A) 12
(B) 18
(C) 10
(D) 15

Q2 How may 3-digit number can be formed with the digits 2,3,4 and 5?
(A) 48
(B) 40
(C) 24
(D) 12

Q3 What is the value of zero factorial?
(A) zero
(B) infinite
(C) two
(D) one

Q4 The value of $(2!+3!)\times 2!$ is equal to:
(A) 16
(B) 12
(C) 14
(D) 18

Q5 In how many ways can the letters of the word "TRIANGLE" be arranged?
(A) 8424
(B) 23690
(C) 40320
(D) 25632

Q6 What will be the value of $4P_3$ divides $3P_2$?
(A) 4

(B) 8
(C) 16
(D) 12

Q7 If you have 5 New year greeting cards and you wish to send it to 3 of your friends, then in how many ways this can be done?
(A) 120
(B) 80
(C) 40
(D) 60

Q8 How many ways can 3 girls and 5 boys be arranged in a row, so that all the three girls are together?
(A) 720
(B) 4320
(C) 17280
(D) 2025

Q9 How many arrangement of the letter of the word "ODISHA" can be formed, if the vowels are always together?
(A) 288
(B) 24
(C) 144
(D) 112

Q10 The value of $4C_3 + 4C_2$ is equal to:
(A) 10
(B) 18
(C) 24
(D) 35

Q11 How many cyclic quadrilaterals can be drawn by using 10 different points on the plane?
(A) 112
(B) 225
(C) 120
(D) 210

Q12 In a box, there are 5 black pens and 3 white pens. In how many ways can 2 black pens and 2 white pens chosen?
(A) 60
(B) 30
(C) 180
(D) 120

Q13 What is the value of nc_0?
(A) two
(B) n
(C) zero
(D) one

Q14 A committee of 5 persons is to be formed from 6 men and 4 women. How many ways it can be done when atleast 2 women are included?
(A) 212
(B) 120
(C) 186
(D) 144

Q15 From 5 consonants and 4 vowels, how many words can be formed by using 3 consonants and 2 vowels?
(A) 7200
(B) 3600
(C) 1240
(D) 2800

Answer to check yourself

1 B	2 C	3 D	4 A	5 C
6 C	7 A	8 D	9 B	10 A
11D	12 B	13 D	14 C	15 A

Stretch Yourself

1. Find the value of r If ${}^{15}P_r = 2730$
2. Find the number of words from the letters of 'BHARAT' where B and H will never come together
3. How many five digit even numbers can be formed by using the digits 0, 2, 3, 4, 5
   (Repetition not allowed)?
4. Eleven members of a committee sit round a circular table. In how many ways can they sit so that the secretary and joint secretary are always neighbours of the president?
5. Using all digits 2, 3, 4, 5, 6, how many even numbers can be formed?