

Permutations And Combinations

Important Result

The following results are important as they help in problem-solving

1. Number of permutations (or arrangements) of n different things taken all at a time = $n!$
2. Number of permutations of n things out of which P_1 are like and are of one type, P_2 are like and are of a second type and P_3 are like are of a third type and the rest are all different = $n! / P_1! P_2! P_3!$

Examples: The number of words formed with the letters of the words ALLAHABAD.

Total number of letters = 9 of which A occurs four times, L occurs twice and the rest are all different.

Total number of words formed = $9! / (4! 2! 1!)$

3. Number of permutations of n different things taken r at a time when repetition is allowed = $n \times n \times n \times \dots$ (r times) = n^r .
4. Example: In how many ways can 4 rings be worn in the index, ring finger and middle finger if there is no restriction of the number of rings to be worn on any finger?

Solution: Each of the 4 rings could be worn in 3 ways either on the index, ring or middle finger.

So, 4 rings could be worn in $3 \times 3 \times 3 \times 3 = 3^4$ ways.

5. Total number of selection of zero or more things out of k identical things = $k + 1$. (Tool No. 4) this includes the case when zero articles are selected.

CIRCULAR PERMUTATIONS

Consider Two Situations There are three people A, B, C. In the first case, they are arranged linearly and in the other, around a circular table:

Important Result

1. Number of ways of arranging n people on a circular track (circular arrangement) = $(n - 1)!$
2. When clockwise and anti-clockwise observation are not different then number of circular arrangements of n different things = $(n - 1)! / 2$ (Tool No. 12)

Example: the case of a necklace with different beads.

The same arrangement when looked at from the opposite side, becomes anti-clockwise.

3. Number of selection of k consecutive things out of n things in a circle

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$= n$ when $k < n$

$= 1$ when $k = n$