

# Comparison between Optimized and traditional Combinations of Combinatorics

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**Abstract:** This paper compares the traditional combination of combinatorics with the optimized combination introduced by Chinnaraji Annamalai, Indian Institute of Technology Kharagpur. This comparison of combinatorial combinations will be useful for the researchers who are involving to solve the problems in science and management.

**MSC Classification codes:** 05A10

**Keywords:** optimized combination, binomial coefficient, combinatorics

## I. Introduction

The combinatorics involves with the problems of selection, arrangement, and operation within a discrete system. In this paper, the comparison between optimized [1-7] and traditional combinations defined in the field of combinatorics is discussed for applications in science and management.

## II. Comparison between Traditional and Optimized Combinations

The optimized combination [1, 2] of combinatorics is expressed as follows:

$$V_r^n = \frac{(r+1)(r+2)\cdots(r+n)}{n!} = \prod_{i=1}^n \frac{r+i}{n!} \quad (n, r \geq 1 \text{ \& } n, r \in N).$$

The traditional combination of combinatorics is shown below:

$$nC_r = \frac{n!}{r!(n-r)!} = \frac{(r+1)(r+2)\cdots(r-(n-1))}{(n-1)!} = \prod_{i=1}^{n-1} \frac{r+i}{(n-1)!}$$

where  $N = \{1, 2, 3, \dots\}$ ,  $V_r^n$  is a binomial coefficient, and  $n!$  is the factorial of  $n$ .

The comparison between optimized combination and traditional combination are given below:

$V_x^y = V_y^x$  denoted the optimized combination. Let  $z = x + y$ . Then,  $zC_x = zC_y$ .

For example,

$$V_3^5 = V_5^3 = (5+3)C_3 = (5+3)C_5 = 56$$

Note that both  $V_r^n$  and  $nC_r$  are not equal.

### III. Conclusion

This paper compares the traditional combination of combinatorics and optimized combination introduced by Chinnaraji Annamalai[1-7]. This comparison of combinatorial results will be useful for the researchers who are involving to solve the scientific problems.

### IV. References

- [1] Annamalai C (2020) “Combinatorial Technique for Optimizing the combination”, The Journal of Engineering and Exact Sciences – jCEC, Vol. 6(2), pp 0189-0192
- [2] Annamalai C (2019) “A Model of Iterative Computations for Recursive Summability”, Tamsui Oxford Journal of Information and Mathematical Sciences – Airiti Library, Vol. 33(1), pp 75-77
- [3] Annamalai C (2020) “Novel Computing Technique in combinatorics, Archive ouverte HAL. <https://hal.archives-ouvertes.fr/hal-02862222>
- [4] Annamalai C (2020) “Optimized Computing Technique for Combination in Combinatorics, Archive ouverte HAL. <https://hal.archives-ouvertes.fr/hal-02865835>
- [5] Annamalai C (2022) “Combinatorial Relation of Optimized Combination with Permutation”, OSF Preprint,. <https://doi.org/10.31219/osf.io/ymk8b>
- [6] Annamalai C (2022) “Binomial Expansion with Optimized Combination of Combinatorics”, Zenodo Preprint, DOI: [10.5281/zenodo.6460772](https://doi.org/10.5281/zenodo.6460772)
- [7] Annamalai C (2022) .” Novel Binomial Series and its Summations”, Authorea Preprint, DOI: [10.22541/au.164933885.53684288/v2](https://doi.org/10.22541/au.164933885.53684288/v2)