Expressions of Combinations

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Abstract

The operation Combination is a powerful operation in mathematics. Combination operation as an infinite series with 2n and n result in many mathematical constants. Some of them have been demonstrated in this paper.

Keywords

Combinations, Wolfram, Expressions, Infinite series, constants, π , e, golden ratio, $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}\sqrt{17}$;

Introduction

Humans have wondered about presence and absence. I have written papers on "Expressions for 1" for presence and "Expressions for 0" for absence. These are very important expressions. In fact, Wikipedia treats 0 and 1 as general mathematical constants.

Advancement from 1 is essentially a combination exercise that a human undergoes. He sees similarity between two things to count as 2 from 1. This is an important thought process of an individual. Another important thing a man realizes is that some things are desirable and some things are not desirable. And the human begins to wonder the world of his as a mixture of these two aspects.

The above thought process of a human is the combination. The combination comb(2n,n) which is also written as $\binom{2n}{n}$.

In this paper I have considered the combination of n and 2n over an infinite series to express the mathematical constants that they give. Indeed, the expression $\operatorname{comb}(2n,n)$ or $\binom{2n}{n}$ is very beautiful which gives many mathematical constants.

The expressions for mathematical constants π , *e*, golden ratio, $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$, $\sqrt{17}$ are obtained.

My special thanks to Wolfram for their brilliant mathematical widget without which these expressions could not have been tested and confirmed for correctness.^[1]

The expressions on π

$$\sum_{2}^{\inf} \left(\frac{(2^n)}{\binom{2n}{n}} \right) = \pi/2$$

The above expression has been checked in Wolfram alpha.^[1]



If we take $1/\binom{2n}{n}$, $(n^*n)/\binom{2n}{n}$, $(n^*n^*n)/\binom{2n}{n}$, $(n^*n^*n^*n)/\binom{2n}{n}$, \dots $(n^*n^*n^*n^*n^*n^*n)/\binom{2n}{n}$ and so on the result of summation from 0 to infinity is some rational number+some number* π in all the cases. Some snapshots from Wolfram alpha is attached below.[1]

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The expression on e $\sum_{0}^{inf} \left(\frac{\binom{2n}{n}}{permutation (2n,n)} \right) = e$

The above expression has been checked in Wolfram alpha.^[1]

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The expression on 1.61803...., the Golden Ratio

$$\frac{1}{2} + 1/2 \sum_{0}^{inf} \left(\left((5^n) \binom{2n}{n} \right) \right) = 1.61803 \dots$$

The above expression has been checked in Wolfram alpha.^[1]

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The expressions on irrational numbers of the type \sqrt{n}

$$\begin{split} &\Sigma_{0}^{inf} \left(\left(2^{-3n} \right) \binom{2n}{n} \right) = \sqrt{2} \\ &3/2 \sum_{0}^{inf} \left(\left(4^{-2n} \right) \binom{2n}{n} \right) = \sqrt{3} \\ &\Sigma_{0}^{inf} \left(\left(5^{-2n} \right) \binom{2n}{n} \right) = \sqrt{5} \\ &\Sigma_{0}^{inf} \left(\left(\left(17^{-3n} \right) / (34^{-2n}) \right) \binom{2n}{n} \right) = \sqrt{17} \end{split}$$

The above expression has been checked in Wolfram alpha.^[1]

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References

[1] https://www.wolframalpha.com/