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Extension of ACM for Computing the Geometric Progression

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Short Research Article

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Abstract

This paper presents a novel approach to ACM-geometric progression [1,3] and it is very useful for research in science and technology [3].

Keywords: ACM-geometric progression; Annamalai theorem.

1 Introduction

Annamalai theorems [1,2] or Annamalai computing models (ACM) [3] play key roles in research fields such as computer science, information systems, electrical & electronics, medicine, computational biology, etc.

Annamalai Theorems

$$\sum_{i=k}^{n-1} 2^i = 2^n - 2^k \tag{1}$$

$$\sum_{i=k}^{n-1} 3^i = \frac{3^n - 3^k}{2} \tag{2}$$

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$$\sum_{i=k}^{n-1} 4^i = \frac{4^n - 4^k}{3} \tag{3}$$

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m-1) $\sum_{i=k}^{n-1} m^i = \frac{m^n - m^k}{m-1}$

Proof :

Theorem 1:

$$\sum_{i=k}^{n-1} 2^i = 2^n - 2^k$$ [1, 3]

Please refer to my journal paper entitled "A novel computational technique for the geometric progression of powers of two" in the reference section.

The other theorems can be proved as above [1].

Theorem 2:

$$3^n = 3^n$$
$$3^n = 3^{n-1} + 3^{n-1} + 3^{n-1}$$
$$3^n = 2(3^{n-1}) + 3^{n-2} + 3^{n-2} + 3^{n-2}$$

Similarly, we can continue this mathematical expression as follows

$$3^n = 2(3^{n-1}) + 2(3^{n-2}) + 2(3^{n-3}) + ... + 2(3^i) + ...2(3^k) + 3^k$$
$$\therefore \sum_{i=k}^{n-1} 3i = \frac{3^n - 3^k}{2}$$

Theorem 3:

$$4^n = 4^n$$
$$4^n = 4^{n-1} + 4^{n-1} + 4^{n-1} + 4^{n-1}$$
$$4^n = 3(4^{n-1}) + 4^{n-2} + 4^{n-2} + 4^{n-2} + 4^{n-2}$$

Similarly, we can continue this mathematical expression as follows

$$4^n = 3(4^{n-1}) + 3(4^{n-2}) + 3(4^{n-3}) + ... + 3(4^i) + ... + 3(4^k) + 4^k$$
$$\therefore \sum_{i=k}^{n-1} 4^i = \frac{4^n - 4^k}{3}$$

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Theorem (m-1) [2]:

$$m^n = m^n$$
$$m^n = m^{n-1} + m^{n-1} + ... + m^{n-1} \quad \text{(m times)}$$
$$m^n = (m-1)(m^{n-1}) + (m-1)(m^{n-2}) + (m-1)(m^{n-3}) + ... + (m-1)m^i + ... + (m-1)m^k + m^k$$
$$\therefore \sum_{i=k}^{n-1} m^i = \frac{m^n - m^k}{m-1}$$

2 Conclusion

In the research study, ACM [1,2,3] will be very useful for researchers involving in broad research areas such as computer science, information systems, electrical & electronics, biomedicine, computational biology, etc.

Competing Interests

Author has declared that no competing interests exist.

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