



Educational material about mathematical sequences used on the website

The creator has studied and researched the documents. and related research as follows

1. Arithmetic Sequence

An arithmetic sequence is a sequence in which the difference between successive terms is constant.

General formula:

$$a_n = a_1 + (n - 1)d$$

Where:

- a_n = n-th term
- a_1 = First term
- d = Common Different
- n = position of the term

2. Geometric Sequence

A geometric sequence is a sequence in which each term is obtained by multiplying the previous term by a constant ratio (r).

General formula:

$$a_n = a_1 \cdot r^{n-1}$$

โดยที่:

- a_n = n-th term
- a_1 = first term
- r = Common Ratio
- n = position of the term

3. Polynomial Sequence

A polynomial sequence is a sequence where each term a_n can be expressed as a polynomial in n .

General formula:

$$\begin{array}{cccccc}
 a_1 & a_2 & a_3 & a_4 & a_5 & a_6 \\
 \vee & \vee & \vee & \vee & \vee & \\
 d_1 & ? & ? & ? & ? & \\
 \vee & \vee & \vee & \vee & & \\
 d_2 & ? & ? & ? & & \\
 \vee & \vee & \vee & & & \\
 d_3 & d_3 & d_3 & & & \\
 & \dots & & & &
 \end{array}$$

$$a_n = An^k + Bn^{k-1} + \dots + Z$$

Here, k is the degree of the polynomial, which can be determined by repeatedly taking differences between consecutive terms until a constant difference is obtained.

General Formula:

$$a_n = \sum_{k=0}^{n-1} \binom{n-1}{k} \cdot d_k$$

where:

- a_n = n -th term
- $d_0 = a_1$

4. Polynomial Division Sequence

Has a similar property to polynomial sequence, but involves multiplication.

The general formula of the n -th term of an polynomial division sequence can be written as:

$$a_n = \prod_{k=0}^{n-1} d_k^{\binom{n-1}{k}}$$

where:

- a_n = n -th term
- d_k = the first term of the row at the index k

5. ลำดับฮาร์โมนิก

Definition: A harmonic sequence is a sequence a_n whose reciprocals $b_n = \frac{1}{a_n}$ form an arithmetic sequence.

$$\frac{1}{a_1}, \frac{1}{a_2}, \frac{1}{a_3}, \dots, \frac{1}{a_n}$$

That is

$a_1, a_2, a_3, \dots, a_n$ is an arithmetic sequence (AP)

$$\frac{1}{a_1}, \frac{1}{a_2}, \frac{1}{a_3}, \dots, \frac{1}{a_n}$$

then its reciprocals form a harmonic sequence.

Thus, the n -th term of a harmonic sequence is:

$$\frac{1}{a_n} = \frac{1}{a_1 + (n-1)d}$$

6. ลำดับเวียนเกิด

is a sequence that relies on previous terms for calculation, such as the Fibonacci sequence that is the sum of two previous terms.

$$a_n = a_{n-1} + a_{n-2}$$

7. ลำดับที่เกิดจากสูตร

7.1 Lagrange polynomial

A polynomial is a mathematical tool used to construct an interpolation curve that passes through all given data points. It provides an exact interpolation of each point.

Procedure:

1. Assume there are data points $(x_0, y_0), (x_1, y_1), \dots, (x_n, y_n)$ with a total of $n+1$ points.
2. Construct the polynomial (a polynomial of degree equal to the number of data points) that passes through all these points.

นิยาม:

Thus, the polynomial that passes through $(x_0, y_0), (x_1, y_1), \dots, (x_n, y_n)$, where $x_0 < x_1 < \dots < x_n$, is

called the Lagrange polynomial.
$$L(x) = \sum_{i=0}^n \left(y_i \cdot \prod_{j=0, j \neq i}^n \frac{x-x_j}{x_i-x_j} \right)$$