

Warm up

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Objective: Solve and identify arithmetic sequence and series.

Arithmetic sequences add a common difference to each term, creating the next term.

Notation:

a_1 means

a_n means

d means

$$a_1, a_1 + d, a_1 + 2d, \dots, a_1 + (n-1)d, \dots$$

$$\text{Formula: } a_n = a_1 + (n-1)d$$

$$a_n = dn + c$$

For each arithmetic sequence below

a) find the common difference

b) find the 10th term

c) find a recursive rule for the nth term

d) find an explicit rule for the nth term

1. -6, -2, 2, 6, 10, ...

2. 6, 10, 14, 18, ...

a)

$$d = 10 - 6 = 4$$

b) n^{th} term

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

$$a_n = -6 + (n-1)4$$

$$a_n = -6 + 4n - 4$$

$$a_n = 4n - 10$$

b) $a_{10} = 4(10) - 10$

$$a_{10} = 30$$

c) $a_{n+1} \rightarrow$ the next term

$a_n \rightarrow$ the current term

$a_{n-1} \rightarrow$ the previous term

$$-6, -2, 2, 6, 10, \dots$$

$$a_{n+1} = a_n + 4$$

all arith. sequences recursive formula is:
 $a_{n+1} = a_n + d$

$$a_n = a_{n-1} + 4$$

$$a_6 = a_{6-1} + 4$$

$$a_6 = a_5 + 4$$

$$a_6 = 10 + 4$$

$$a_6 = 14$$

STAT/EDIT

$$a_4 = -8$$

L₁ → term #'s

$$a_7 = 4$$

L₂ → term

STAT/CALL/4/VARS/Y/VARS/E/E/E

- i. The fourth and seventh terms of an arithmetic sequence are -8 and 4 , respectively. Find the first term and a recursive rule for the n th term.

$$d = \frac{a_7 - a_4}{7 - 4} = \frac{4 - (-8)}{7 - 4} = \frac{12}{3} \quad (d = 4)$$

$$a_{n+1} = a_n + d$$

$$a_{n+1} = a_n + 4$$

$$a_n = a_{n-1} + 4$$

Find the explicit rule for this function.

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

$$a_n = a_1 + (n-1)4$$

$$a_n = 20 + (n-1)4$$

$$a = 4n - 24$$

$$-8 = a_1 + (4-1)4$$

$$-8 = a_1 + 12$$

$$a_1 = -20$$

~~Partial Sum/Finite Sum/ S_n~~

$$S_n = \frac{n}{2} (a_1 + a_n)$$

$$1, 2, 3, 4, \dots, 97, 98, 99, 100$$

Ex Find the 9th partial sum.

$$S_9 = \frac{9}{2} (-20 + a_9)$$

$$S_9 = \frac{9}{2} (-20 + 12)$$

$$S_9 = \frac{9}{2} (-8)$$

$$S_9 = -36$$

$$\rightarrow a_n = 4n - 24$$

$$a_9 = 4(9) - 24$$

$$a_9 = 12$$

The first two terms of the arithmetic sequence is given, find the missing term.

1. $a_1 = 5$, $a_2 = 11$, find a_{10} .

2. $a_1 = 4.2$, $a_2 = 6.6$, find a_7 .

3. Determine the seating capacity of an auditorium with 30 rows of seats if there are 20 seats in the 1st row, 24 seats in the 2nd row, 28 seats in the 3rd row, and so on.

The sum of a sequence is called a series.

DEFINITION Summation Notation

In summation notation, the sum of the terms of the sequence $\{a_1, a_2, \dots, a_n\}$ is denoted

$$\sum_{k=1}^n a_k$$

which is read “the sum of a_k from $k = 1$ to n .”

The variable k is called the **index of summation**.

Example find

$$\sum_{n=1}^6 2n + 1$$

$$\sum_{n=1}^5 n^2$$

$$\sum_{k=1}^4 k^2 + k$$

Write in summation form the following series

1. -3,3,9,.....111

2. 4,-1,-6,.....-19

Finding the sum of Arithmetic series

$$= n \left(\frac{a_1 + a_n}{2} \right)$$

Using this formula, find the sum of the arithmetic sequence.

-7, -3, 1, 5, 9, 13

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