Arithmetic sequences and series

11.2

nth term of an arithmetic sequence

$$a_n = a_1 + (n-1)d \quad \text{or}$$

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

Where a_1 is the first term

a_n is the last term

d is the common difference

n is the order of the last term

Find the indicated term of each arithmatic sequence

1) $a_1 = -18$, $d = 12$, $n = 16$…… $a_{16} = ?????$

Ans:

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

$a_{16} = -18 + 12 (16 – 1) = 162$

$a_{16} = 162$

Your turn

2) $a_1 = 9$, $n = 24$, $d = -6$ …… $a_{24} = ?????$

Answer :

$$a_{24} = -129$$

Another idea

3) a_{24} for 8.25 , 8.5 , 8.75 , ……

Ans :

$a_1 = 8.25$, d = 8.5- 8.25= 0.25 , n= 24 …… a_{24}= ….

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

$a_{24} = 8.25 + 0.25(24-1)$

$a_{24} = 14$

Your turn ……

a_{15} for -5 , -12 , -19 , ……

Answer : a_{15} = - 103

Write an equation for the nth term of each arithmetic sequence

4) 24,35,46 , ……

$a_1 = 24$

d = 11

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

$a_n = 24 + 11(n-1)$

$a_n = 24 + 11n - 11$

$a_n = 13 + 11n$

Your turn

5) 31 , 17 , 3 , ……

Answer :

$$a_n = 45 - 14n$$

Another Idea

6) $a_6 = 22$, $d = 9$

$a_n = a_6 = 22$

$n = 6$

We have to find a_1

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

$22 = a_1 + 9(6-1)$

$a_1 = -23$

now

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

$a_n = -23 + 9(n-1)$

$a_n = 9n - 32$

Your turn

7) $a_8 = -8$, $d = -2$

Answer:

$a_n = -2n + 8$

Find the arithmetic means in each sequence

8) 24 , ? , ? ,? , ? , -1

We need to find **d**

But what we have?
We have $a_1 = 24$
Also we have $a_6 = -1$
Sooooooo …n = 6

Then :

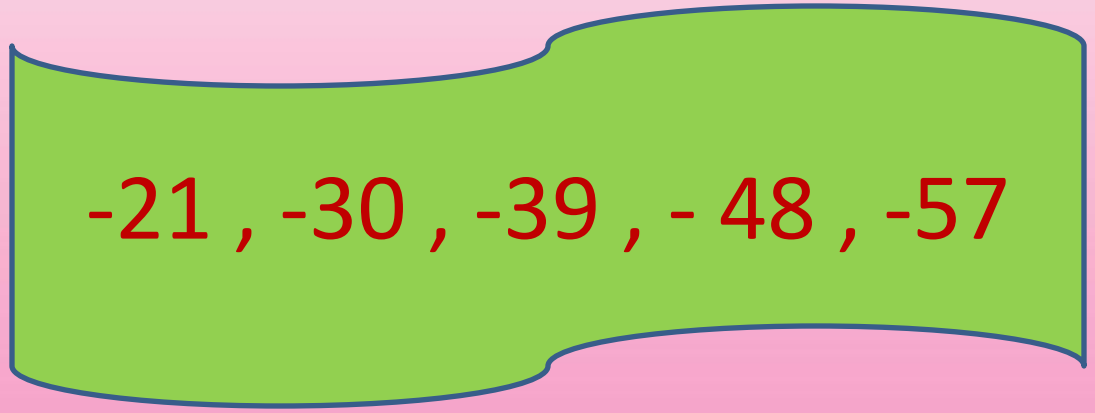
$a_n = a_1 + d(n-1)$
$a_6 = a_1 + d(6-1)$
$-1 = 24 + d\ (5)$
$d = -5$

The arithmetic means are :
19 , 14 , 9 , 4

Your turn

9) -12 , ? ,? ,? , ? ,? , -66

Answer:



Partial Sum Of An Arithmetic Series

Formula	Given	The sum S_n of the first n terms is:
General	a_1 and a_n	$S_n = n\left(\frac{a_1 + a_n}{2}\right)$
Alternate	a_1 and d	$S_n = \frac{n}{2}[2a_1 + (n-1)d]$

Find the sum of each arithmetic series

10) -18 + (-15) + (-12) + ……+ 66

We need to find **n**

But what do we have ?

We have : $a_1 = -18$

$a_n = 66$ and $d = 3$

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

$66 = -18 + 3(n-1)$

$n = 29$

Now we can get the sum of the given series (29 terms)

$S_n = n/2 ((a_1 + a_n)/2)$
$= 29 ((-18 + 66)/2)$
$S_n = 696$

or

$S_n = n/2 (2 a_1 + (n-1)d)$
$= 29/2 (2(-18)+(29-1)(3))$
$S_n = 696$

Your turn !!!!!!!!!

11) -24 + (-18) + (-12) + ……+72

Answer : $S_n = 408$

Another Idea !!!!!!!!

12) Find the sum of the first 100 even natural numbers.

We have :

$a_1 = 2$, d =2

AND n= 100

We need to find a_n

Ok .....

$S_n = n/2 (2 a_1 + (n-1)d)$

$=100/2(2(2)+2(100-1)$

$=10100$

Find the sum of each arithmetic series

$$\sum_{k=4}^{13}(4k+1)$$

K=4 ……..4(4)+1=17

K=5…….. 4(5)+1=21

…..

K=13…….4(13)+1=53 and so on

$$\sum_{k=4}^{13}(4k+1) = 17 + 21 + \ldots\ldots\ldots\ldots + 53$$

but we can use our calculators to find it .

$$\sum_{k=4}^{13}(4k+1) = 350$$

Thank you