

**AIM:** How can create and use the explicit formula to find the "nth" term of an Arithmetic Sequence?

### Explicit Formula

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

### Vocabulary of Sequences

$a_1$  → First term

$a_n$  → nth term

$n$  → number of terms

$d$  → common difference

An explicit is used to define the pattern of sequences. Using the explicit formula you can calculate the value of the  $n^{\text{th}}$  term.

1. Given the sequence 8, 14, 20, 26, 32 ...

a) Write the explicit formula.

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

$$a_n = 8 + 6(n - 1)$$

$$a_n = 8 + 6n - 6$$

$$a_n = 6n + 2$$

$$a_1 = 8$$

$$d = 6$$

Sequence term	$a_n$
$a_1$	8
$a_2$	14
$a_3$	20
$a_4$	26
$a_5$	32

b) Use the explicit formula to find the 20<sup>th</sup> term ( $a_{20}$ ).

$$n = 20 \quad a_n = 6n + 2$$

$$a_{20} = 6(20) + 2$$

$$a_{20} = 122$$

20<sup>th</sup> term is 122

2. Given the arithmetic sequence 18, 23, 28, 33, 48 ...

a) Write the explicit formula

$$a_1 = 18$$

$$d = 5$$

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

$$a_n = 18 + 5(n-1)$$

$$a_n = 18 + 5n - 5$$

$$\boxed{a_n = 5n + 13}$$

Sequence term	$a_n$
$a_1$	18
$a_2$	23
$a_3$	28
$a_4$	33
$a_5$	48

b) Use the explicit formula to find the 16<sup>th</sup> term ( $a_{16}$ ).

$$n = 16 \quad a_n = 5n + 13$$

$$a_{16} = 5(16) + 13$$

$$\boxed{a_{16} = 93}$$

16<sup>th</sup> term is 93

3. Given the arithmetic sequence 5, 1, -3, -7 ...

a) Write the explicit formula

$$a_1 = 5$$

$$d = -4$$

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

$$a_n = 5 - 4(n-1)$$

$$a_n = 5 - 4n + 4$$

$$\boxed{a_n = -4n + 9}$$

Sequence term	$a_n$
$a_1$	5
$a_2$	1
$a_3$	-3
$a_4$	-7
$a_5$	-11

b) Use the explicit formula to find the 30<sup>th</sup> term ( $a_{30}$ ).

$$n = 30 \quad a_n = -4n + 9$$

$$a_{30} = -4(30) + 9$$

$$\boxed{a_{30} = -111}$$

30<sup>th</sup> term is -111

4. Given the arithmetic sequence 15, 13, 11, 9, 7,.....

a) Write the explicit formula

$$a_1 = 15$$

$$d = -2$$

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

$$a_n = 15 + 2(n-1)$$

$$a_n = 15 + 2n - 2$$

$$\boxed{a_n = 2n + 13}$$

Sequence term	$a_n$
$a_1$	15
$a_2$	13
$a_3$	11
$a_4$	9
$a_5$	7

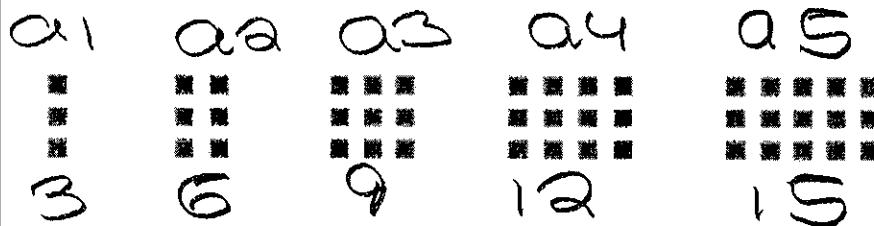
b) Use the explicit formula to find the 34<sup>th</sup> term ( $a_{34}$ ).

$$n = 34 \quad a_n = 2n + 13$$

$$a_{34} = 2(34) + 13$$

$$\boxed{a_{34} = 81}$$

5. Use an explicit formula to find out what the 50<sup>th</sup> term in this sequence would be?



$$a_1 = 3$$

$$d = 3$$

Sequence term	$a_n$
$a_1$	3
$a_2$	6
$a_3$	9
$a_4$	12
$a_5$	15

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

$$a_n = 3 + 3(n-1)$$

$$a_n = 3 + 3n - 3$$

$$\boxed{a_n = 3n}$$

$$n = 50 \quad a_{50} = 3(50)$$

$$\boxed{a_{50} = 150}$$

6. Find the 25<sup>th</sup> term of the arithmetic sequence in which  $a_1=5$  and  $d=4$

a. 100  $a_1 = 5$

b. 124  $d = 4$

c. 101  $n = 25$

d. 125  $a_n = a_1 + d(n-1)$   
 $a_{25} = 5 + 4(25-1)$

$a_{25} = 101$

7. Write an equation for the  $n$ th term of the arithmetic sequence  $-7, -2, 3, 8, \dots$

a.  $a_n = n + 5$

b.  $a_n = 5n - 12$

c.  $a_n = -7n + 12$

d.  $a_n = -7(n+5)$

$a_1 = -7$

$d = +5$

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

$a_n = -7 + 5(n-1)$

$a_n = -7 + 5n - 5$

$a_n = 5n - 12$

8. A theater has 60 seats in the first row, 68 seats in the second row, 76 seats in the third row, and so on in the same increasing pattern. If the theater has 10 rows, how many seats are in the 10th row?

$a_1 = 60$

$d = 8$

$n = 10$

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

$a_{10} = 60 + 8(10-1)$

$a_{10} = 60 + 72$

$a_{10} = 132$