



## Section 4.2 Arithmetic sequences

$$\begin{aligned}
 & T_1 \quad T_2 \quad T_3 \\
 & 3, \underbrace{6}, \underbrace{9}, \dots 12, 15 \\
 & \quad +3 \qquad \qquad \qquad (d) \\
 & T_2 - T_1 = 3 \quad \text{common difference} \\
 & T_3 - T_2 = 3 \\
 & T_{n+1} - T_n = 3
 \end{aligned}$$

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**PROJECT MATHS**  
**Text & Tests 6**

Gauss

As a child  
Worked out how  
to sum an  
arithmetic series



ADD UP NOS from 1 to 100?

$$\begin{aligned}
 \text{Sum} &= 1 + 2 + 3 + \dots + 99 + 100 \\
 \text{Sum} &= \frac{100 + 99 + 98 + \dots + 2 + 1}{2} \\
 2\text{Sum} &= 101 + 101 + 101 + \dots + 101 + 101
 \end{aligned}$$

$$2\text{Sum} = 100(101) = 10100$$

$$\text{Sum} = \frac{10100}{2} = 5050$$

Sum of:  $2 + 4 + 6 + \dots + 98 + 100 = ?$

$$\begin{aligned} \text{Sum} &= 2 + 4 + 6 + \dots + 98 + 100 \\ \text{Sum} &= 100 + 98 + 96 + \dots + 4 + 2 \\ 2 \text{ Sum} &= 102 + 102 + 102 + \dots + 102 + 102 \\ 2 \text{ Sum} &= 102(50) = 5100 \\ \text{Sum} &= \frac{5100}{2} = 2550 \end{aligned}$$

### Example 1

Find the  $n$ th term ( $T_n$ ) of the arithmetic sequence:

-2, 3, 8, 13, ....

and hence find (i)  $T_{20}$  (ii)  $T_{21}$  (iii)  $T_{21} - T_{20}$ .

In every arithmetic sequence

$$T_n = a + (n-1)d \quad (\text{in tables})$$

• Find  $T_n$ ?

Sequence: -2, 3, 8, 13 ...  
 $\downarrow +5 \quad \downarrow +5$

$$d = 5 \quad T_1 = a = -2 \quad n = n$$

$$T_n = -2 + (n-1)5 \\ = -2 + 5n - 5$$

$$T_n = 5n - 7$$

$a = 1^{\text{st}} \text{ term}, T_1$

$d = \text{common diff.}$

$n = \text{no. of term}$

(i)  $T_{20} = 5(20) - 7 = 100 - 7 = 93$

(ii)  $T_{21} = 5(21) - 7 = 105 - 7 = 98$

(iii)  $T_{21} - T_{20} = 98 - 93 = 5$