

- 1 The second and fifth terms of an arithmetic series are 40 and 121 respectively.
- a Find the first term and common difference of the series. (4)
- b Find the sum of the first 25 terms of the series. (2)
- 2 A sequence is defined by the recurrence relation
- $$u_r = u_{r-1} + 4, \quad r > 1, \quad u_1 = 3.$$
- a Write down the first five terms of the sequence. (1)
- b Evaluate $\sum_{r=1}^{20} u_r$. (3)
- 3 The first three terms of an arithmetic series are t , $(2t - 5)$ and 8.6 respectively.
- a Find the value of the constant t . (2)
- b Find the 16th term of the series. (4)
- c Find the sum of the first 20 terms of the series. (2)
- 4 a State the formula for the sum of the first n natural numbers. (1)
- b Find the sum of the natural numbers from 200 to 400 inclusive. (3)
- c Find the value of N for which the sum of the first N natural numbers is 4950. (3)
- 5 A sequence of terms $\{u_n\}$ is defined, for $n \geq 1$, by the recurrence relation
- $$u_{n+1} = k + u_n^2,$$
- where k is a non-zero constant. Given that $u_1 = 1$,
- a find expressions for u_2 and u_3 in terms of k . (3)
- Given also that $u_3 = 1$,
- b find the value of k , (3)
- c state the value of u_{25} and give a reason for your answer. (2)
- 6 a Find the sum of the integers between 1 and 500 that are divisible by 3. (3)
- b Evaluate $\sum_{r=3}^{20} (5r - 1)$. (3)
- 7 a Prove that the sum, S_n , of the first n terms of an arithmetic series with first term a and common difference d is given by
- $$S_n = \frac{1}{2}n[2a + (n - 1)d]. \quad (4)$$
- b An arithmetic series has first term -1 and common difference 6.
Verify by calculation that the largest value of n for which the sum of the first n terms of the series is less than 2000 is 26. (3)
- 8 A sequence is defined by the recurrence relation
- $$t_{n+1} = 4 - kt_n, \quad n > 0, \quad t_1 = -2,$$
- where k is a positive constant.
- Given that $t_3 = 3$, show that $k = -1 + \frac{1}{2}\sqrt{6}$. (6)

- 9 An arithmetic series has first term 6 and common difference 3.
- a Find the 20th term of the series. (2)
- Given that the sum of the first n terms of the series is 270,
- b find the value of n . (4)
- 10 A sequence of terms t_1, t_2, t_3, \dots is such that the sum of the first 30 terms is 570.
Find the sum of the first 30 terms of the sequences defined by
- a $u_n = 3t_n, n \geq 1$, (2)
- b $v_n = t_n + 2, n \geq 1$, (2)
- c $w_n = t_n + n, n \geq 1$. (3)
- 11 Tom's parents decide to pay him an allowance each month beginning on his 12th birthday. The allowance is to be £40 for each of the first three months, £42 for each of the next three months and so on, increasing by £2 per month after each three month period.
- a Find the total amount that Tom will receive in allowances before his 14th birthday. (4)
- b Show that the total amount, in pounds, that Tom will receive in allowances in the n years after his 12th birthday, where n is a positive integer, is given by $12n(4n + 39)$. (4)
- 12 A sequence is defined by
- $$u_{n+1} = u_n - 3, n \geq 1, u_1 = 80.$$
- Find the sum of the first 45 terms of this sequence. (3)
- 13 The third and eighth terms of an arithmetic series are 298 and 263 respectively.
- a Find the common difference of the series. (3)
- b Find the number of positive terms in the series. (4)
- c Find the maximum value of S_n , the sum of the first n terms of the series. (3)
- 14 a Find and simplify an expression in terms of n for $\sum_{r=1}^n (6r + 4)$. (3)
- b Hence, show that
- $$\sum_{r=n+1}^{2n} (6r + 4) = n(9n + 7). \quad (4)$$
- 15 The n th term of a sequence, u_n , is given by
- $$u_n = k^n - n.$$
- Given that $u_2 + u_4 = 6$ and that k is a positive constant,
- a show that $k = \sqrt{3}$, (5)
- b show that $u_3 = 3u_1$. (3)
- 16 The first three terms of an arithmetic series are $(k + 4)$, $(4k - 2)$ and $(k^2 - 2)$ respectively, where k is a constant.
- a Show that $k^2 - 7k + 6 = 0$. (2)
- Given also that the common difference of the series is positive,
- b find the 15th term of the series. (4)