**1.** Consider the following sequence:

$$57, 55, 53 \ldots, 5, 3$$

(a) Find the number of terms of the sequence.

**(3)**

(b) Find the sum of the sequence.

**(3)**

**(Total 6 marks)**

**2.** The first five terms of an arithmetic sequence are shown below.

$$2, \quad 6, \quad 10, \quad 14, \quad 18$$

(a) Write down the sixth number in the sequence.

(b) Calculate the $200^{th}$ term.

(c) Calculate the sum of the first 90 terms of the sequence.

**(Total 8 marks)**

**3.** The first term of an arithmetic sequence is 7 and the sixth term is 22. Find

(a) the common difference;

**(2)**

(b) the twelfth term;

**(2)**

(c) the sum of the first 100 terms.

**(2)**

**(Total 6 marks)**

**4.** The first three terms of an arithmetic sequence are

$$2k + 3,\ 5k - 2 \text{ and } 10k - 15.$$

(a) Show that $k = 4$.

**(3)**

(b) Find the values of the first three terms of the sequence.

**(1)**

(c) Write down the value of the common difference.

**(1)**

(d) Calculate the $20^{th}$ term of the sequence.

**(2)**

(e) Find the sum of the first 15 terms of the sequence.

**(2)**

**(Total 9 marks)**

**5.** The $n^{th}$ term of an arithmetic sequence is given by $u_n = 63 - 4n$.

(a) Calculate the values of the first two terms of this sequence.

**(2)**

(b) Which term of the sequence is –13?

**(2)**

(c) Two consecutive terms of this sequence, $u_k$ and $u_{k+1}$, have a sum of 34. Find $k$.

**(3)**

**(Total 7 marks)**

**6.** Given the arithmetic sequence: $u_1 = 124$, $u_2 = 117$, $u = 110$, $u_4 = 103$, …

(a) Write down the common difference of the sequence.

**(1)**

(b) Calculate the sum of the first 50 terms of the sequence.

**(2)**

$u_k$ is the first term in the sequence that is negative.

(c) Find the value of $k$.

**(3)**

**(Total 6 marks)**

**7.** A teacher earns an annual salary of 45 000 USD for the first year of her employment
Her annual salary increases by 1750 USD each year.

(a) Calculate the annual salary for the fifth year of her employment.

**(3)**

She remains in this employment for 10 years.

(b) Calculate the **total** salary she earns in this employment during these 10 years.

**(3)**
**(Total 6 marks)**

**8.** A concert choir is arranged, per row, according to an arithmetic sequence. There are 20 singers in the fourth row and 32 singers in the eighth row.

(a) Find the common difference of this arithmetic sequence.

**(3)**

There are 10 rows in the choir and 11 singers in the first row.

(b) Find the **total** number of singers in the choir.

**(3)**
**(Total 6 marks)**

**9.** A tree begins losing its leaves in October. The number of leaves that the tree loses each day increases by the same number on each successive day.

| **Date in October** | 1 | 2 | 3 | 4 | ..... |
|---|---|---|---|---|---|
| **Number of leaves lost** | 24 | 40 | 56 | 72 | ..... |

(a) Calculate the number of leaves that the tree loses on the 21st October.

**(3)**

(b) Find the total number of leaves that the tree loses in the 31 days of the month of October.

**(3)**
**(Total 6 marks)**

**10.** Each day a runner trains for a 10 km race. On the first day she runs 1000 m, and then increases the distance by 250 m on each subsequent day.

(a) On which day does she run a distance of 10 km in training?

(b) What is the total distance she will have run in training by the end of that day? Give your answer exactly.

*Working:*

*Answers*:

(a) .....

(b) .....

**(Total 4 marks)**

**11.** Find the sum of the arithmetic series

$$17 + 27 + 37 + ... + 417.$$

*Working:*

*Answer*:

.....

**(Total 4 marks)**

**12.** Arturo goes swimming every week. He swims 200 metres in the first week. Each week he swims 30 metres more than the previous week. He continues for one year (52 weeks).

(a) How far does Arturo swim in the final week?

(b) How far does he swim altogether?

*Working:*

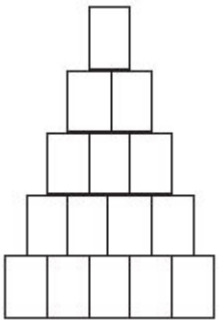
*Answers*:

(a) .....

(b) .....

**(Total 6 marks)**

**13.** Clara organizes cans in triangular piles, where each row has one less can than the row below. For example, the pile of 15 cans shown has 5 cans in the bottom row and 4 cans in the row above it.



(a) A pile has 20 cans in the bottom row. Show that the pile contains 210 cans.

**(4)**

(b) There are 3240 cans in a pile. How many cans are in the bottom row?

**(4)**

(c) (i) There are $S$ cans and they are organized in a triangular pile with $n$ cans in the bottom row. Show that $n^2 + n - 2S = 0$.

(ii) Clara has 2100 cans. Explain why she cannot organize them in a triangular pile.

**(6)**

**(Total 14 marks)**