Sequence Basics

Section A – Mild

Recognizing arithmetic sequences and identifying the common difference.

1. Consider the sequence: $5, 8, 11, 14, \ldots$
   a) Identify the first term, a.
   b) Identify the common difference, d.
   c) Write the next two terms.

2. Determine whether each sequence is arithmetic. If it is, identify its common difference.
   a) $1, 2, 4, 8, \ldots$
   b) $15, 15, 15, 15, \ldots$
   c) $12, 8, 4, 0, \ldots$

3. An arithmetic sequence has a first term of -2 and a common difference of 3. Write its first five terms.

4. Mila says that the common difference of the sequence: $11, 8, 5, 2, \ldots$ is 3 because each number is three units apart.
   a) Is Mila correct?
   b) Identify the common difference and explain why its sign matters.

Section B – Medium

Interpreting arithmetic sequence formulas and writing simple formulas.

5. Consider the arithmetic sequence:

   $$2, 6, 10, 14, \ldots$$

   a) Identify the first term, a, and common difference, d.
   b) How many times must you add the common difference to reach the 10th term?
   c) Construct a formula for t_n that works for any position n.

6. Consider the formula: $t_n = 20 - 3(n - 1)$
   a) Identify a and d.
   b) Calculate the first four terms.
   c) Use the formula to calculate t_{15}.

7. Construct an arithmetic sequence formula for: $17, 13, 9, 5, \ldots$ Show how you identified a and d.

8. Consider three arithmetic sequences:

   Sequence A starts at 4 and increases by 2.
   Sequence B starts at 10 and increases by 2.
   Sequence C starts at 4 and decreases by 2.

   a) Write the first three terms of each sequence.
   b) Explain how changing a affects a sequence.
   c) Explain how changing d affects a sequence.

Section C – Spicy

Constructing arithmetic sequence formulas and calculating distant terms.

9. Determine the 25th term of the arithmetic sequence: $8, 13, 18, 23, \ldots$

10. Determine the 40th term of the arithmetic sequence: $34, 29, 24, 19, \ldots$

11. Determine the 65th term of the arithmetic sequence: $-3, -8, -13, -18, \ldots$

12. Determine the 120th term of the arithmetic sequence: $-10, -6, -2, 2, \ldots$ Explain why your answer is positive or negative.

Section D – Extra Spicy

Use the arithmetic sequence formula when appropriate. Show your reasoning without listing all the preceding terms.

13. Hui plants 14 flowers in the first row of a garden and 5 additional flowers in each subsequent row. Determine how many flowers would be planted in the 80th row. Show your formula and calculations.

14. A company produces 250 units of a product during its first week of operation. Production increases by 15 units each subsequent week. Determine the number of units produced during the 52nd week. Show your formula and calculations.

15. Two arithmetic sequences are represented by:

$$Sequence\ A\text{:}\ \ t_n = 7 + 4(n-1)$$
$$Sequence\ B\text{:}\ \ t_n = 20 + (n-1)$$

Determine which sequence has the larger 100th term and explain why.

16. A learner writes the formula:$t_n = 9 + 3n$ for the arithmetic sequence: $9, 12, 15, 18, \ldots$ Explain the error, write the correct formula, and demonstrate why the difference matters when calculating t_{150}.

17. Two learners construct different formulas for an arithmetic sequence:

$$Learner\ A\text{:}\ \ t_n = 8 + 3(n-1)$$
$$Learner\ B\text{:}\ \ t_n = 3n + 5$$

Determine whether both formulas produce the same 200th term. Then use algebra to determine whether the formulas represent the same arithmetic sequence for every value of n.

18. Create an arithmetic sequence with a negative first term, a positive common difference, and a positive 100th term. Construct its formula and demonstrate that it satisfies all three conditions.