Daily Sequences Drill #1

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Section	Topic	Questions	Target time
A	Rapid Recognition	10	2 min 30 sec
B	Manipulation Drills	10	8 min
C	Substitution & Structure	8	10 min
D	Challenge	5	15 min

New toolkit today: Arithmetic Sequences & Series · nth-term & Sum Formulas · S_n as a Quadratic in n.

Attempt each question before checking answers. Time yourself. No calculators.

Section A Rapid Recognition

($\leq$15 s each)

The nth-term and sum formulas on sight. Pure recognition, full speed.

1. Write down the nth term of the arithmetic sequence $5, 8, 11, 14, \ldots$

2. An AP has first term 7 and common difference -3. Find the 20th term.

3. An AP has first term 4 and common difference 5. Find the sum of the first 10 terms.

4. A sequence has nth term $4n-1$. Write down its first three terms, and state whether the sequence is arithmetic.

5. An AP has $a_1 = 2$ and $a_5 = 18$. Find the common difference.

6. Evaluate $1 + 2 + 3 + \cdots + 50$.

7. An AP has $S_n = n^2 + 3n$. Find the first term a_1.

8. True or false: every arithmetic sequence with integer first term and integer common difference consists entirely of integers.

9. An AP has 3rd term 13 and 9th term 37. Find the common difference.

10. An AP has first term 4 and 6th term 29. Find the common difference.

Section B Manipulation Drills

($\leq$50 s each)

Two-step setups: solve for the sequence's parameters, then use them.

1. An AP has first term 3, last term 59, and 15 terms. Find the common difference and the sum of all 15 terms.

2. The sum of the first 8 terms of an AP is 100, and the sum of the first 4 terms is 30. What is the sum of terms 5 through 8?

A) 50

B) 70

C) 130

D) 100

3. Prove that $3 + 6 + 9 + \cdots + 3n = \dfrac{3n(n+1)}{2}$ using the arithmetic series sum formula.

4. An AP has 21 terms summing to 315. Find the middle (11th) term.

A) 15

B) 315

C) 21

D) It cannot be determined without knowing a and d.

5. An AP has first term 10 and common difference -3. Find the last term of the sequence that is still positive.

6. Which of the following is NOT necessarily true for an arithmetic sequence with common difference $d > 0$?

A) The sequence is strictly increasing.

B) $a_{n+1} - a_n = d$ for every n.

C) The sequence is unbounded above.

D) All terms are positive.

7. Two APs share the same common difference d. Their first terms differ by 6. What is the difference between their nth terms, for any n?

A) 6

B) $6 + (n-1)d$

C) $6n$

D) It depends on d.

8. An AP has $a_3 = 11$ and $a_3 + a_5 = 32$. Find the common difference.

A) 3

B) 4

C) 5

D) 6

9. An AP has first term a and common difference d, both positive integers, and its 5th term equals 17. Which pair (a, d) is NOT possible?

A) $(13, 1)$

B) $(9, 2)$

C) $(5, 3)$

D) $(2, 4)$

10. An AP with first term 2 and common difference 3 (terms $2, 5, 8, 11, \ldots$) and a GP with first term 2 and common ratio 2 (terms $2, 4, 8, 16, \ldots$) are compared term by term. At which term number do they next agree, within the first 6 terms of each?

A) $n = 2$

B) $n = 3$

C) $n = 4$

D) They never agree again within 6 terms.

Section C Substitution & Structure ($\leq$90 s each)

Structure over computation — what must be true, not just what is true for one example.

1. An AP has n integer terms ($n \geq 2$) summing to 15. Which of the following must be true? *(after TMUA 2019 Paper 2 Q11)*

I. n is even.

II. The first term is odd.

III. The common difference is odd.

A) none of them

B) I only

C) II only

D) III only

E) I and II only

F) I and III only

G) II and III only

H) I, II and III

2. The sequences $a_n = 2n + 1$ and $b_n = 3n - 2$ are both arithmetic. Let $c_n = a_n + b_n$. Which is true about (c_n)?

A) It is arithmetic with common difference 5.

B) It is arithmetic with common difference 6.

C) It is not arithmetic in general.

D) It is geometric.

3. An AP (a_n) has common difference d. What can be said about $b_n = a_n^2$?

A) (b_n) is always arithmetic.

B) (b_n) is always geometric.

C) (b_n) is arithmetic only if $d = 0$.

D) (b_n) is arithmetic only if $a_1 = 0$.

4. An AP has all terms positive. The sum of the first 6 terms equals the sum of terms 7 through 10. Which must be true?

A) The common difference d must be positive.

B) d must be negative.

C) d must be zero.

D) d can have either sign.

5. An AP has positive integer first term a and common difference d with $a < d$. Which pair (a, d) gives a sequence that contains the term 100 exactly?

A) $(5, 19)$

B) $(6, 17)$

C) $(7, 23)$

D) $(8, 13)$

6. An AP with first term a and common difference d satisfies $S_{2n} = 2S_n$ for some particular $n > 0$. What does this force?

A) d must equal 0.

B) a must equal 0.

C) n must be even.

D) No constraint — this holds automatically for every AP.

7. For an AP with common difference $d \neq 0$, the sum S_n of the first n terms, viewed as a function of n, is:

A) linear in n.

B) quadratic in n with no linear term.

C) quadratic in n.

D) exponential in n.

8. $S_n = 3n^2 - n$ is the sum of the first n terms of an arithmetic sequence. Find its common difference.

A) 3

B) 6

C) -1

D) 2

Section D Challenge (TMUA / SMC difficulty)

Insight over computation. Each question has a short, elegant route — find it.

1. An AP has first term a and common difference d. The sum of the first 6 terms equals the sum of the first 11 terms. Which relationship between a and d does this force? *(after TMUA 2018 Paper 1 Q2)*

A) $a = -8d$

B) $a = 8d$

C) $a = -\dfrac{17}{2}d$

D) $a = \dfrac{17}{6}d$

E) $a = -4d$

2. A selection S of n terms is taken from the arithmetic sequence $2, 5, 8, \ldots, 80$. What is the smallest value of n for which there must be two distinct terms in S summing to 82? *(after TMUA 2022 Paper 2 Q8)*

A) 13

B) 14

C) 15

D) 22

E) 23

F) 24

3. The first four terms of an arithmetic sequence p, $p+d$, $p+2d$, $p+3d$ (with $d > 0$) are all prime, and $p > 3$. Prove that d must be a multiple of 6.

4. An AP has $S_n = An^2 + Bn$. Given $A = 5$ and that the 10th term of the sequence is 91, find B.

A) -4

B) 4

C) -9

D) 9

5. A sequence (a_n) (not assumed arithmetic) is such that its first differences $a_{n+1} - a_n$ themselves form an arithmetic sequence in n. What can be said about a_n as a function of n?

A) (a_n) must itself be arithmetic.

B) a_n is a quadratic function of n.

C) (a_n) must be geometric.

D) No general conclusion can be drawn.

"An AP is linear in n; its sum is quadratic in n. Most of the errors today will be confusing the two."

Found a mistake or want to contribute a sheet?
Visit the open-source project at github.com/The-CerealDev/speed-maths