



CAMI Mathematics: Grade 12

12.2 Patterns, sequences and series

12.2 Arithmetic series

1. Determine T_{13} of the sequence for which the following holds:
 $S_{12} = 150$ and $S_{13} = 169$.
2. Calculate the sum of the first 17 odd numbers.
3. Calculate the sum of the 18 terms in the following series:
-10 -13 -16 -61
4. How many terms are in the following series?
-16 - 23 - 30 - 128
5. The sum of an arithmetic series is 102, the value of $T_1 = -19$ and $T_8 = 16$. Determine the number of terms in the series.
6. Calculate the sum of the first 22 terms of the arithmetic series for which the value of $T_1 = -18$ and $T_2 = -13$.
7. In an arithmetic series $T_7 = 10$ and $S_7 = -14$. Calculate the first term and the constant difference between the terms.
8. The sum of the first 4 terms of an arithmetic sequence is -14, and the sum of the first 10 terms is -65. Calculate a and d .
9. The sum of T_1 and T_4 of an arithmetic sequence is 18. What is the sum of the first 4 terms of the sequence?
10. Find the sum of all odd natural numbers smaller than 24.



MEMO

12.2 Arithmetic series [4.1.6.4; 4.1.6.7; 4.1.6.8]

1.

$$T_{13} = S_{13} - S_{12}$$

$$T_{13} = 169 - 150$$

$$T_{13} = 19$$

2. 1 3 5 7

$$a = 1; d = 2$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_{17} = \frac{17}{2}(2(1) + 16(2))$$

$$S_{17} = 289$$

3. -10 -13 -16 -61

$$a = -10; d = -3$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_{18} = \frac{18}{2}(2(-10) + 17(-3))$$

$$S_{18} = -639$$

4. -16 - 23 - 30 - 128

$$a = -16; d = -7$$

$$T_n = a + (n-1)d$$

$$-128 = -16 + (n-1)(-7)$$

$$-128 = -16 - 7n + 7$$

$$7n = 119$$

$$\therefore n = 17$$



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5. $T_1 = -19 = a$

$$T_8 = 16$$

$$16 = -19 + 7d$$

$$7d = 35$$

$$\therefore d = 5$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$102 = \frac{n}{2}(2(-19) + (n-1)(5))$$

$$204 = n(-43 + 5n)$$

$$0 = n = 125n^2 - 43n - 204$$

$$n = 12$$

6. $T_1 = -18 = a$

$$T_2 = -13$$

$$-13 = a + d$$

$$-13 = -18 + d$$

$$\therefore d = 5$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_{22} = \frac{22}{2}(2(-18) + 21(5))$$

$$S_{22} = 759$$

7. $T_7 = 10$

$$10 = a + 6d$$

$$a = 10 - 6d$$

$$S_7 = -14$$

$$-14 = \frac{7}{2}(2a + 6d)$$

$$-28 = 14a + 42d$$

$$-28 = 14(10 - 6d) + 42d \quad a = 10 - 6d$$

$$-28 = 140 - 84d + 42d \quad a = 10 - 6(4)$$

$$-168 = -42d \quad a = 10 - 24$$

$$\therefore d = 4 \quad a = -14$$

Substitution:

8. $S_4 = -14$

$$-14 = \frac{4}{2}(2a + 3d)$$

$$-14 = 4a + 6d$$

$$S_{10} = -65$$

$$-65 = \frac{10}{2}(2a + 9d)$$

$$-65 = 10a + 45d$$

Solve equations simultaneously:

$$-14 = 4a + 6d$$

$$-7 = 2a + 3d$$

$$2a = -7 - 3d$$

$$-65 = 10a + 45d$$

$$-13 = 2a + 9d$$

$$2a = -13 - 9d$$



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$$-7 - 3d = -13 - 9d$$

$$-7 + 13 = 3d - 9d$$

$$\therefore 6 = -6d$$

$$\therefore d = -1$$

$$\therefore a = -2$$

9.

$$T_1 + T_4 = 18$$

$$a + a + 3d = 18$$

$$2a + 3d = 18$$

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_4 = \frac{4}{2}(2a + 3d)$$

$$S_4 = 2(18)$$

$$S_4 = 36$$

10. 1 ; 3 ; 5 ;23

$$S_n = \frac{n}{2}(2a + (n-1)d)$$

$$S_{12} = \frac{12}{2}(2(1) + 11(2))$$

$$S_{12} = 6(24)$$

$$S_{12} = 144$$

