Arithmetic Series – Word Problems

1. A model railway manufacturer produces track pieces with lengths 8 cm, 10 cm, 12 cm, … , 38 cm. An enthusiast buys one piece of each length.
   a. Identify the first term and common difference.
   b. Write the arithmetic series.
   c. Determine the total length of track purchased.

2. A staircase has 12 steps. The first step is 18 cm high, and each step after that increases in height by 0.5 cm.
   a. Identify the first term and common difference.
   b. Write an arithmetic series that models the total height.
   c. Determine the total vertical height of the staircase.

3. Seven logs are cut from a single log measuring 77 ft. The shortest log is 5 ft long. Each log increases in length by the same amount.
   a. State the values of n and t_1.
   b. Write an equation for the total length.
   c. Determine the common difference.

4. Nine wooden planks are cut from a board measuring 81 ft. The shortest plank is 5 ft long. Each plank increases in length by the same amount.
   a. Identify n and t_1.
   b. Write the sum equation.
   c. Determine the common difference.

5. An arithmetic series has 13 terms, a common difference of -6, and a sum of 32.5.
   a. Write the sum formula.
   b. Determine the first term.
   c. Write the arithmetic sequence.

6. An arithmetic series has 15 terms and a common difference of 4. The sum of the series is 615.
   a. Write the sum formula.
   b. Determine the first term.
   c. Write the arithmetic sequence.

7. Corey is choosing between two jobs:
   - Job A pays \$1500 per month with a monthly raise of \$150.
   - Job B pays \$300 per week with a weekly raise of \$15.

   a. Write an arithmetic series for each job's earnings over one year.
   b. Determine the total earned from each job after one year.
   c. Which job pays more, and by how much?

8. Two phone plans offer monthly bonus minutes:
   - Plan A starts with 100 minutes and increases by 20 minutes each month.
   - Plan B starts with 160 minutes and increases by 10 minutes each month.

   a. Write an arithmetic series for each plan over 12 months.
   b. Determine the total minutes for each plan after one year.
   c. Which plan provides more minutes after one year?

9. If $S_5 = 85$ and $S_6 = 123$:
   a. Determine the 6th term.
   b. Find the common difference.
   c. Write the general term of the sequence.

10. If $S_4 = 26$ and $S_5 = 35$:
   a. Determine the 5th term.
   b. Find the common difference.
   c. Write the general term of the sequence.

11. Ten brothers share 100 shekels. Each younger brother receives a constant amount more than the next oldest. The seventh oldest brother receives 7 shekels.
   a. Identify the first term and common difference.
   b. Determine how much each brother receives.
   c. Verify that the total is 100 shekels.

12. A total of 180 points are awarded over 12 levels of a game. Each level awards a constant number of points more than the previous one. The final level awards 25 points.
   a. Identify the first term and common difference.
   b. Determine how many points are awarded at each level.
   c. Verify that the total is 180 points.

13. An arithmetic series has 20 terms and a total sum of 820. The last term of the series is 62.
   a. Write an equation for the sum of the series.
   b. Determine the first term.
   c. Find the common difference.
   d. Write the sequence.

14. The sum of the first 15 terms of an arithmetic series is 450. The 5th term of the series is 26.
   a. Write an equation for the 5th term in terms of $a$and d.
   b. Write an equation for the sum of the first 15 terms.
   c. Solve for the first term and the common difference.
   d. What is the arithmetic sequence?