Determine whether the following sequences are arithmetic, geometric, or neither. If arithmetic, find the common difference. If geometric, find the common ratio.

1. 40, 20, 10, 5...
2. 5, −2, −9, −16...
3. \(\frac{1}{2}, 4, \frac{15}{2}, 11...\)
4. 1, 4, 9, 16...

5. What is the value of the first term in the arithmetic sequence if \(a_6 = 87\) and \(a_{12} = 129\)?
6. Write the formula for the \(n\)th term of the arithmetic sequence if \(a_4 = -10\) and \(a_{10} = -25\).

7. Write the first five terms of the sequence.
\[a_n = \frac{(-1)^n}{(2n+1)!}\]

8. Write the first five terms of the sequence defined recursively.
\[a_1 = 9, \ a_{k+1} = a_k - 4\]

9. Find the sum of the first 120 terms of the arithmetic sequence with the given characteristics. \(a_1 = 12\) and \(d = 3\).
10. Simplify the factorial expression.
\[\frac{(2n-1)!}{(2n+1)!}\]

11. Find the partial sum.
\[\sum_{n=3}^{80} 5n\]
12. Given the series \(-12 + 2 + 16 + ... + 506\). Determine how many terms are being added; then find the sum.
13. Write the first five terms of the sequence defined recursively by \(a_1 = 49, \ a_{k+1} = 2a_k + 6\)

14. Find the sum of the first 100 positive multiples of 5.

15. Find the first five terms of the geometric sequence if \(a_1 = 9\) and \(a_3 = 4\)

16. Find the \(n\)th term of the geometric sequence. Then, find the sum of the first 20 terms. Round two decimal places.
   \(a_1 = 16\) and \(a_2 = -8\)

17. Write an expression for the apparent \(n\)th term of the sequence. 2, \(\frac{2}{3}, \frac{2}{5}, \frac{2}{7}, \frac{2}{9}, \ldots\)

18. Simplify the factorial. \(\frac{513!}{510!}\)

19. Find the sum. \(\sum_{i=0}^{4} (i^2 + 1)\)

20. Find the sum. \(\sum_{i=1}^{\infty} 4 \left(\frac{2}{3}\right)^{i-1}\)

21. Find the sum. \(\sum_{i=1}^{\infty} 5 \left(\frac{3}{2}\right)^{i}\)

22. Find the sum. \(\sum_{i=1}^{5} (3)^{i-1}\)

23. Use sigma (summation) notation to write the sum. \(10 + 15 + 20 + 25\)

24. Use sigma (summation) notation to write the sum. \(\frac{1!}{2} + \frac{2!}{4} + \frac{3!}{8} + \frac{4!}{16} + \frac{5!}{32} + \frac{6!}{64}\)