**Practice Test**

Sequences and Series

Determine if the following sequences are arithmetic, geometric, or neither. If the sequence is arithmetic, find $d$. If the sequence is geometric, find $r$.

1. $-1, 3, 7, 11, \ldots$

2. $1, 4, 9, 16, \ldots$

3. $a_n = 7 - n$

4. $5, -10, 20, -40, \ldots$

5. $a_n = 4n^3 - 2$

6. $a_n = 7\left(\frac{1}{2}\right)^n$

Both of the sequences described below are <u>arithmetic</u>. For each one, find a formula for the $n^{\text{th}}$ term. Then use your formula to calculate the $30^{\text{th}}$ term.

7. $a_2 = 0 \quad d = -2$

8. $a_3 = 8 \quad a_7 = 32$

Both of the sequences described below are <u>geometric</u>. For each one, find a formula for the $n^{\text{th}}$ term. Then use your formula to calculate the $7^{\text{th}}$ term.

9. $a_1 = 6 \quad r = 1.5$

10. $a_3 = 24 \quad a_4 = 48$

11. Describe why the formula $S_n = \frac{n(a_1+a_n)}{2}$ will not produce the correct answer for the sum $\sum_{k=1}^{50}(2k^2+1)$.

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Calculate the following and use them for questions 15–22 when necessary.

12. $\sum_{k=1}^{12} 1$

13. $\sum_{k=1}^{12} k$

14. $\sum_{k=1}^{12} k^2$

Calculate the following.

15. $\sum_{k=1}^{10} 2\left(\frac{3}{2}\right)^k$

16. $\sum_{k=-28}^{-1} (3k+7)$

17. $\sum_{k=3}^{\infty} 8\left(\frac{1}{2}\right)^k$

18. $\sum_{k=1}^{12} (2k^2-13k)$

19. $\sum_{k=2}^{40} \left(\frac{k}{2}-5\right)$

20. $\sum_{k=1}^{\infty} \frac{2}{3}k$

21. $\sum_{k=7}^{8} (-1)^k k$

22. $\sum_{k=1}^{12} (k-9)(k+1)$

23. If the sum $\sum_{k=0}^{21} k^4$ is equal to 917,147, what must $\sum_{k=-21}^{21} k^4$ be equal to? Explain.

24. How many terms are listed in the following sequence?

$$5, 8, 11, 14, \ldots, 74$$

Rewrite each of the following sums using sigma notation.

25. $10 + 16 + 22 + 28 + 34$

26. $3 - 6 + 12 - 24 + 48 - 96$

27. $2 + 5 + 10 + 17 + 26 + 37 + 50$

28. $3 + \frac{3}{2} + 1 + \frac{3}{4} + \frac{3}{5} + \frac{1}{2}$

Extra credit thoughts:

If $a_1, a_2, a_3, \ldots$ is an arithmetic sequences, you already know the formula for the partial sums $S_n$ and $S_k$. Can you use these two formulas to produce one for $\sum_{i=k}^{n} a_i$?

Could an infinite arithmetic series (besides the trivial series 0 + 0 + 0 + ...) ever equal anything other than $\infty$ or $-\infty$? Why or why not?

What must be true about $i$ if $\sum_{k=-n}^{n} k^i = 0$ for any value of $n$?