



California Standards Algebra 22.0, 23.0

Arithmetic and Geometric Series

Example

Find the Sum of the Series

Write a rule for the n th term of the sequence. Then find S_{14} .

2, 8, 14, 20, ...

Solution

The sequence is arithmetic with the first term $a_1 = 2$ and the common difference $d = 8 - 2 = 6$.

STEP 1 Find a rule for the n th term of the series.

$$\begin{aligned} a_n &= a_1 + (n - 1)d && \text{Write the general rule.} \\ &= 2 + (n - 1)6 && \text{Substitute 2 for } a_1 \text{ and 6 for } d. \\ &= -4 + 6n && \text{Simplify.} \end{aligned}$$

The 14th term is $a_{14} = -4 + 6(14) = 80$.

STEP 2 Find S_{14} .

$$\begin{aligned} S_n &= n \left(\frac{a_1 + a_n}{2} \right) && \text{Write the general rule.} \\ S_{14} &= 14 \left(\frac{2 + 80}{2} \right) && \text{Substitute 14 for } n, 2 \text{ for } a_1, \text{ and 80 for } a_{14}. \\ &= 14(41) && \text{Simplify.} \\ &= 574 && \text{Multiply.} \end{aligned}$$

Exercises

1. What is the sum of the infinite geometric series

$$\frac{2}{3} + \frac{2}{9} + \frac{2}{27} + \dots ?$$

- (A) $\frac{5}{6}$
 (B) $\frac{2}{3}$
 (C) 1
 (D) The sum does not exist.

2. What is the n th term in the arithmetic series 14, 19, 24, 29, ...?

- (A) $5n$
 (B) $5n + 9$
 (C) $4n - 2$
 (D) $4n - 1$

3. Which statement is true for the summation formula for a finite geometric series if $|r| < 1$?

$$S_n = a_1 \left(\frac{1 - r^n}{1 - r} \right)$$

- (A) As n approaches 1, r^n approaches 1.
 (B) As n goes to ∞ , r^n approaches 0.
 (C) As n goes to ∞ , r^n approaches 1.
 (D) As n approaches 0, r^n approaches 0.

4. For the series $\frac{1}{5} + \frac{1}{25} + \frac{1}{125} + \dots$, what is S_4 ?

- (A) $\frac{1}{625}$
 (B) $\frac{4}{625}$
 (C) $\frac{156}{625}$
 (D) 1