Lesson 4 Geometric Series

A geometric series is the sum of the terms of a geometric sequence.

Geometric sequence: $1, 3, 9, 27, ...$

Geometric Series: $1 + 3 + 9 + 27 + \cdots$

Deriving the Formula for the Partial Sum of *n* terms of a Geometric Series

$$S_n = \frac{t_1(1 - r^n)}{1 - r}, r \neq 1$$

where: S_n is the sum of the first *n* terms
t_1 is the first term of the series
r is the common ratio
n is the number of terms

Examples

1. Determine the sum of the first 12 terms of the given geometric series.
   $3 + 12 + 48 + 192 + \cdots$

2. The sum of the first 14 terms of a geometric series is $16\,383$. The common ratio is -2. Determine the value of the 1st term.

3. Calculate the sum of the given geometric series.
   $-3 - 15 - 75 - \ldots - 46\,875$

4. A person takes tablets to cure a chest infection. Each tablet contains 500 mg of an antibiotic. About 15% of the mass of the antibiotic remains in the body when the next tablet is taken. Determine the mass of antibiotic in the body after each number of tablets.

   a) 3 tablets

   b) 10 tablets

5. Evaluate.

$$\sum_{k=1}^{10} 3(-2)^{k-1}$$

6. Express the given geometric series in sigma notation with the index $k = 1$.

$6 + 18 + 54 + 162 + 486$