

Series and Sigma Notation 30

The sum of several terms of a geometric sequence is called a series.

Example:

Suppose that we have the sequence;

$$2, 4, 8, 16, 32 \dots$$

We can write the series of the first five terms as;

$$2 + 4 + 8 + 16 + 32.$$

We can use sigma notation to write this series. Let $i = 1, 2, 3, 4$ and 5 and add the terms 2^i .

$$\sum_{i=1}^5 [2]^i = 2 + 4 + 8 + 16 + 32 = 62$$

Problems:

1) Write the following series in sigma notation.

a) $3 + 9 + 27 + 81$

b) $1/2 + 1/4 + 1/8$

c) $5 - 20 + 80 - 320$

d) $100 + 10 + 1 + 0.1 + 0.01$

2) Write each geometric series in expanded form.

a) $\sum_{i=1}^6 [2]^{i-1}$

b) $\sum_{i=1}^3 \left[\frac{1}{5} \right]^i$

c) $\sum_{i=1}^4 5 \cdot [2]^i$

d) $\sum_{i=1}^5 [-3]^{i+2}$

3) Find the number of terms i , required in the example above to give a sum of 8190.

Answers: 1)a) $\sum_{i=1}^4 [3]^i$ b) $\sum_{i=1}^3 \left[\frac{1}{2}\right]^i$

c) $\sum_{i=1}^4 5 \cdot [-4]^{i-1}$ d) $\sum_{i=1}^5 100 \cdot \left[\frac{1}{10}\right]^{i-1}$

2)a) $1 + 2 + 4 + 8 + 16 + 32 = 63$, b) $1/5 + 1/25 + 1/125 = 31/125$,
c) $10 + 20 + 40 + 80 = 150$, d) $-27 + 81 - 243 + 729 - 2187 = -1647$,
3) 12.