

Aim: What are the arithmetic series and geometric series?

HW: p.265 # 12,14,20 p.272 # 6,8,10,16
p.278 # 8,10 Green Book p. 10,11 #6-15

Do Now: Find the sum of the following sequences.

a) $\{1,3,5,7,9\}$

b) $\{1,2,3,4,5,6,7,\dots,100\}$

The sum of an arithmetic sequence is an arithmetic series.

The formula to find the sum of an arithmetic series is :

$$S_n = \frac{n(a_1 + a_n)}{2}$$

Find the sum of: $\{1,2,3,4,5,6,7,\dots,100\}$

$$S_{100} = \frac{100(1+100)}{2} = 50(101) = 5050$$

$$S_n = \frac{n(a_1 + a_n)}{2}$$

Find the sum of the first 150 terms of the arithmetic sequence 5, 16, 27, 38, 49, . . .

Steps:

1. What is a_1 ?
2. Find a_n
3. Apply formula

Write the sum of the first 15 terms of the arithmetic series $1 + 4 + 7 + \dots$ in sigma notation and then find the sum

First of all, we need to find the recursive formula

$$a_1 = 1 \text{ and } d = 3$$

$$a_n = 1 + 3(n-1) = 3n-3+1 = 3n-2$$

$$\sum_{n=1}^{15} 3n - 2$$

The sum of an geometric sequence is called a **geometric series**

Sum of a Finite Geometric Series

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

3)

3, 15, 75, 375, 1875, 9375, 46875, 234375, 1171875 is a geometric sequence, find the sum of sequence.

4. Write $10 + \sum_{n=1}^5 10\left(\frac{1}{2}\right)^n$ as a series and then find the sum

5. Write the sum of the first 15 terms of the arithmetic series

$$1 + 4 + 7 + \dots$$

An infinite arithmetic series has no limit

An infinite geometric series has no limit when

$$|r| > 1$$

An infinite geometric series has a finite limit

when $|r| < 1$ the limit can be found by the formula

$$S_n = \frac{a_1}{1-r}$$

Find the sum of the following infinite geometric sequence:
 $4, 4(0.6), 4(0.6)^2, 4(0.6)^3, \dots, 4(0.6)^n, \dots$

$$a_1 = 4 \text{ and } r = 0.6 \quad S = \frac{4}{1-0.6} = \frac{4}{0.4} = 10$$

$$\text{Find } \sum_{n=1}^{\infty} 2\left(\frac{1}{3}\right)^n \quad a_1 = 2, \quad r = \frac{1}{3} \quad S = \frac{2}{1-\frac{1}{3}} = \frac{2}{\frac{2}{3}} = 3$$

Find the sum of the first 10 terms of the geometric series

$$2 + 1 + \frac{1}{2} + \dots$$

Find the sum of five terms of the geometric series whose first term is 2 and fifth term is 162

