

## Geometric Series

A geometric series is obtained by adding the terms of a geometric series

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

Find  $S_7$  for

a)  $5 + 10 + 20 + \dots$

$$S_7 = \frac{5(2^7 - 1)}{2 - 1}$$

$$S_7 = 635$$

b)  $12 + 6 + 3 + \dots$   $S_7$

$$S_7 = \frac{12(0.5^7 - 1)}{0.5 - 1}$$

$$S_7 = 23.81$$

c)  $100 - 50 + 25 - 12.5 + \dots$

$$S_7 = \frac{100((-0.5)^7 - 1)}{-0.5 - 1}$$

$$= 67.19$$

Find the sum of the geometric series  $2 + 6 + 18 + \dots + 1458$ 

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

$$S_7 = \frac{2(3^7 - 1)}{3 - 1}$$

$$S_7 = 2186$$

$t_n = a(r)^{n-1}$   
 $1458 = 2(3)^{n-1}$   
 $729 = 3^{n-1}$   
 $\log 729 = (n-1) \log 3$   
 $\frac{\log 729}{\log 3} = n-1$   
 $n = 7$

$$a = 26,400$$

$$r = 1.03$$

$$S_n = 200,000$$

Find "n"

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

$$200000 = \frac{26400(r^n - 1)}{r - 1}$$

$$6000 = 26400 \frac{(1.03^n - 1)}{1.03 - 1}$$

$$\frac{6000}{26400} = 1.03^n - 1$$

$$\log \left( \frac{6000}{26400} + 1 \right) = n \log 1.03$$

$$\log \left( \frac{6000}{26400} + 1 \right) = n$$

$$\frac{\log \left( \frac{6000}{26400} + 1 \right)}{\log 1.03} = n$$

$$n = 6.9$$

In a geometric series, the first term is 2, the sum of 7 terms is 2186 and the sum of 8 terms is 6560. find the first 3 terms in the series.

**Note:** To find a term in a series take the difference on successive sums.

$$t_8 = S_8 - S_7 \quad \text{OR} \quad t_4 = S_4 - S_3$$

$$t_8 = 6560 - 2186$$

$$t_8 = 4374 \quad a = 2$$

$$t_n = a(r)^{n-1}$$

$$4374 = 2(r)^{8-1}$$

$$r^7 = 2187$$

$$r = 3$$

$$2, \quad \underline{6}, \quad \underline{18}$$

Ryan climbed 60m up a cliff in the first hour. Each subsequent hour he climbed 75% of the distance of the previous hour. What is the total distance Ryan climbed in 5 hours?

$$a = 60$$

$$r = 0.75$$

$$h = 5$$

$$\underline{60} \quad \underline{45} \quad \underline{\quad} \quad \underline{\quad} \quad \underline{\quad}$$

$$S_5 = \frac{60(0.75^5 - 1)}{0.75 - 1}$$

$$S_5 = \underline{183.05 \text{ m}}$$

Pg. 124    1, 3 odds  
                   4  
                   6 odds  
                   7-10