

4.6 Geometric Sums

**The Sum of a Finite Geometric Series:**

The sum of the first  $n$  terms of a geometric series with common ratio  $r \neq 1$  is:

Example:  $\sum_{t=1}^{16} 4(3)^{t-1}$



**Finite Sum.** Given the sequence below, answer the following questions.  $\begin{cases} p_1 = 7 \\ p_n = 4p_{n-1}, n > 1 \end{cases}$

a) Find the explicit formula for the sequence.

b) Evaluate  $\sum_{n=1}^{34} p_n$

**Practice.**

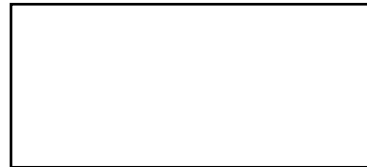
1)  $\sum_{n=1}^9 4 \cdot 3^{n-1}$

2)  $\sum_{n=1}^9 (-2)^{n-1}$

**Infinite Sum.**

**The Sum of an Infinite Geometric Series:**

The sum of an infinite geometric series with first term,  $a_1$ , and Common ratio  $r$  is given by...(provided  $|r| < 1$ )



\*\* If  $|r| \geq 1$ , the series **diverges (has no sum)**.

Examples. 1)  $\sum_{i=1}^{\infty} 5(0.8)^{i-1}$

2)  $1 - \frac{3}{4} + \frac{9}{16} - \frac{27}{64} + \dots$

**Practice.**

1)  $\sum_{n=1}^{\infty} -6 \cdot \left(-\frac{1}{2}\right)^{n-1}$

2)  $\sum_{k=1}^{\infty} 4^{k-1}$

**Write each geometric series in sigma notation and find its sum.**

1)  $3 + 6 + 12 + \dots + 12,288$

2)  $200 + 100 + 50 + 25 + \dots$

Sigma Notation: \_\_\_\_\_

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Sum: \_\_\_\_\_

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**Word Problems.**

- 1) Once a week Mrs. Schenkel makes sugar cookies. The first week she makes the recipe, she uses the full 2 cups of sugar called for. Each week after that, she reduces the amount of sugar by one third.
- a) How much sugar does she use for the cookies on the fifth week?

- b) How much sugar does she use for cookies in a six month period (half a year)?

- 2) A pendulum that is released to swing freely travels 18 inches on the first swing. On each successive swing, the pendulum travels 80% of the distance of the previous swing. What is the total distance the pendulum swings?