Geometric Sequences and Series
Section 6.7

Warm-up: Find the next three terms of the sequence.

1. 2, 4, 8, 16, _____, _____, _____

2. $-\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}$, _____, _____, _____

3. 1, 4, 9, 16, _____, _____, _____

4. 12, 36, 108, _____, _____, _____

Definition of a Geometric Sequence

A sequence is geometric _____.

This ratio is called _____.

Example 1: Write the first five terms of the geometric sequence whose first term is 3 and whose ration is 2.

The *n*th Term of a Geometric Sequence

Formula:

Example 2: Find the 15^{th} term of the geometric sequence whose first term is 20 and whose common ratio is 1.05.

Practice Problem 1: Find the ninth term of the geometric sequence whose first term is 4 and whose common ratio is ½.

Example 3: Find a formula for the *n*th term of the following geometric sequence. What is the ninth term?

5, 15, 45, …

Practice Problem 2: Find a formula for the *n*th term of the following geometric sequence. What is the tenth term?

6, -2, $\frac{2}{3}$, …

When you know *any* two terms of a geometric sequence, you can use that information to find a formula for the nth term of the sequence.

Example 4: The fourth term of a geometric sequence is 125, and the 10^{th} term is $\frac{125}{64}$. Find the 14^{th} term.

Practice Problem 3: The second term of a geometric sequence is -18, and the fifth term is $\frac{2}{3}$. Find the sixth term.

The Sum of a Finite Geometric Sequence

Formula:

Example 5:

a) Find the sum: $\sum_{n=1}^{12} 4(0.3)^n$

b) Find the sum: $\sum_{n=0}^{12} 5(2)^n$

Practice Problem 4: Find the sum: $\sum_{n=0}^{15} 2\left(\frac{4}{3}\right)^n$

The Sum of an Infinite Geometric Series

Formula:

Example 6: Find each sum

a) $\sum_{n=0}^{\infty} 4(0.6)^n$

b) $\sum_{n=0}^{\infty} 5\left(\frac{1}{2}\right)^n$

c) $\sum_{n=0}^{\infty} 2(3)^n$

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Class Work

Determine whether the sequence is geometric. If it is, find the common ratio.

1. 3, 12, 48, 192, …

2. 9, -6, 4, $-\frac{8}{3}$, …

Write the first five terms of the geometric sequence.

3. $a_1 = 2,\ r = \frac{1}{3}$

4. $a_1 = 4,\ r = \sqrt{3}$

Write the first five terms of the geometric sequence. Find the common ratio and write a formula for the *n*th term of the sequence.

5. $a_1 = 81,\ a_{k+1} = \frac{1}{3}a_k$

6. $a_1 = 5,\ a_{k+1} = -3a_k$

Find a formula for the *n*th term of the geometric sequence. Then find the indicated term.

7. 7^{th} term: 3, 36, 432, …

8. 22^{nd} term: 4, 8, 16, …

Find the sum.

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

10. $\sum_{n=0}^{6}500(1.04)^n$

11. $\sum_{n=0}^{\infty}6\left(\frac{2}{3}\right)^n$

12. $\sum_{n=0}^{\infty}8\left(\frac{5}{3}\right)n-1$