12.2 Too Much Homework!
Introduction to Geometric Sequences

Objectives
In this lesson, you will
- List the terms of geometric sequences.
- Define geometric sequences using recursive formulas.
- Define geometric sequences using explicit formulas.

Key Terms
- geometric sequence
- common ratio

Problem 1

Your math teacher decides to propose a new method for assigning homework because everyone has been complaining that he assigns too much. His new homework proposal is to assign one problem on the first day, two on the second day, four on the third day, etc.

1. Write a sequence to show the number of homework problems given to the class on the first through the fifth days.

2. How is the sequence in Question 1 different from arithmetic sequences?

3. Is it appropriate to model this sequence using an arithmetic sequence? Explain why or why not.

4. Write a recursive formula to compute the number of homework problems given to the class on the *n*th day.

5. How is this recursive formula similar to the recursive formulas you wrote in Questions 19 and 20 of the previous lesson? How is it different?

6. Is it more appropriate to model the scenario using a sequence or a function? Explain.

The sequence you wrote to represent your teacher's original proposal is one example of a *geometric sequence*.

A sequence is called a **geometric sequence** if there is a number r such that

$g_n = r \cdot g_{n-1}$

where g_n is the nth term in the sequence, g_{n-1} is the term before the nth term in the sequence, and r is the **common ratio**, the ratio between any two consecutive terms.

7. Complete the table, which displays the day, the number of homework problems received on that day, and how to calculate the number of homework problems received, using multiplication and exponents.

Day	Homework Problems Received	Calculation Using Multiplication	Calculation Using Exponents
1			
2			
3			
4			
5			
6			
7			
8			
n			

8. Suppose the class received 10 homework problems on the first day, and then the number of problems received doubled each day. Complete the table to help generate the explicit formula to calculate the number of problems received on the *n*th day.

Day	Homework Problems Received	Calculation Using Multiplication	Calculation Using Exponents
1			
2			
3			
4			
5			
6			
7			
8			
n			

9. Suppose the class received 10 homework problems on the first day, and then the number of problems received tripled each day. Complete the table to help generate the explicit formula to calculate the number of problems received on the *n*th day.

Day	Homework Problems Received	Calculation Using Multiplication	Calculation Using Exponents
1			
2			
3			
4			
5			
6			
7			
8			
n			

10. Examine the formulas you generated in the last three questions. What do the three formulas have in common? What differences exist?

11. How is the common ratio indicated in the explicit formula to calculate the nth term in each of the last three questions?

12. How is the first term indicated in the explicit formula to calculate the nth term in each of the last three questions?

13. Generate an explicit formula to calculate the nth term of each geometric sequence.

a. The first term is 5 and the common ratio is 3.

b. 40, 60, 90, 135, 202.5, ...

12

c. $-3, -6, -12, -24, -48, \ldots$

d. The first term is g_1 and the common ratio is r.

14. Write a formula for the general geometric sequence

a. using a recursive formula:

b. using an explicit formula:

Be prepared to share your work with another pair, group, or the entire class.