PRACTICE & PROBLEM SOLVING

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Practice Tutorial

Additional Exercises Available Online

UNDERSTAND

11. **Make Sense and Persevere** Explain how to write a formula to describe the sequence 1, 3, 27, 81, 243, ...

12. **Look for Relationships** How are geometric sequences related to exponential growth and decay functions? Explain your reasoning.

13. **Error Analysis** Describe and correct the error a student made when writing a recursive formula from an explicit formula.

Explicit formula

$a_n = 210 \cdot \left(\frac{1}{3}\right)^{n-1}$

Recursive formula

$a_n = \left(\frac{1}{3}\right) \cdot a_{n-1}$ ✗

14. **Use Appropriate Tools** Explain how you could use a graphing calculator to determine whether the data in the table represents a geometric sequence.

n	a_n
1	20
2	90
3	405
4	1822.5
5	8201.25

15. **Higher Order Thinking** In Example 5, a geometric sequence is written as a function.

a. How is the domain of a function related to the numbers in the sequence?

b. How is the range of the function related to the numbers in the sequence?

16. **Mathematical Connections** A pendulum swings 80 cm on its first swing, 76 cm on its second swing, 72.2 cm on its third swing, and 68.59 cm on its fourth swing.

a. If the pattern continues, what explicit formula can be used to find the distance of the n^{th} swing?

b. Use your formula to find the distance of the 10^{th} swing.

PRACTICE

Determine whether the sequence is a geometric sequence. If it is, write the recursive formula.

SEE EXAMPLES 1 AND 2

17. 8, 12, 18, 27, 40.5, ...

18. $3, \frac{3}{2}, \frac{3}{4}, \frac{3}{8}, \frac{3}{16}, \ldots$

19. $\frac{1}{27}, \frac{1}{9}, \frac{1}{3}, 1, 3, \ldots$

20. $\frac{10}{3}, \frac{8}{3}, 2, \frac{4}{3}, \frac{2}{3}, \ldots$

21. 1, 1, 2, 3, 5, ...

22. $2, \frac{8}{3}, \frac{32}{9}, \frac{128}{27}, \frac{512}{81}, \ldots$

23. 1, 1.2, 1.4, 1.6, 1.8, ...

24. $\frac{1}{2}, 2, 8, 32, 128, \ldots$

25. 9, 18, 36, 74, 144, ...

26. $\frac{4}{5}, 4, 20, 100, 500, \ldots$

Write the recursive formula for the sequence represented by the explicit formula. SEE EXAMPLE 3

27. $a_n = \frac{1}{5}(10)^{n-1}$

28. $a_n = 1.1(6)^{n-1}$

29. $a_n = \frac{2}{3}(5)^{n-1}$

30. $a_n = 0.4(8)^{n-1}$

Write an explicit formula for each sequence represented by the recursive formula. SEE EXAMPLE 5

31. $a_n = \frac{4}{5}(a_{n-1})$, $a_1 = 100$

32. $a_n = 8(a_{n-1})$, $a_1 = 1$

33. $a_n = \frac{5}{9}(a_{n-1})$, $a_1 = 10$

34. $a_n = 6(a_{n-1})$, $a_1 = 7$

Write each geometric sequence as a function.

SEE EXAMPLE 4

35. $a_n = \frac{3}{4}(a_{n-1})$, $a_1 = 20$

36. $a_n = 3(a_{n-1})$, $a_1 = 7$

37. $a_n = 4(2)^{n-1}$

38. $a_n = 99\left(\frac{2}{3}\right)^{n-1}$

Write a function to model each geometric sequence in the table.

39.

n	a_n
1	9
2	3
3	1
4	$\frac{1}{3}$
5	$\frac{1}{9}$

40.

n	a_n
1	18
2	54
3	162
4	486
5	1,458

APPLY

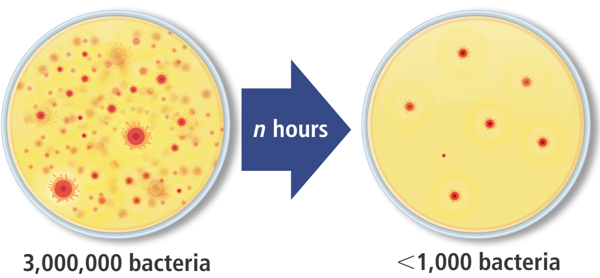
41. Make Sense and Persevere A new optical illusion is posted to the Internet. Write a recursive formula to describe the pattern. Then, write the explicit formula that can be used to find the number of times the optical illusion is shared after eight hours?

42. Construct Arguments Write the recursive formula for a geometric sequence that models the data in the table. Use the explicit formula to determine whether there will be 1,000 participants by the tenth year of the Annual Clean-Up Day.

Annual Clean-up Day

Year	Participants
1	16
2	24
3	36
4	54
5	81

43. Model With Mathematics The number of bacteria in the sample shown decreases by a factor of $\frac{2}{3}$ every hour. Write a geometric sequence to model the pattern. How many hours will it take for the number of bacteria to decrease below 1,000?



ASSESSMENT PRACTICE

44. Is each sequence shown a geometric sequence? Select *Yes* or *No*.

	Yes	No
6, 18, 30, 42, 54, …	☐	☐
$2, 3, \frac{9}{2}, \frac{27}{4}, \frac{81}{8}, \ldots$	☐	☐
1024, 256, 64, 16, 4, …	☐	☐
243, 162, 81, 54, 27, …	☐	☐

45. SAT/ACT What is the explicit formula for the sequence 360, 180, 90, 45, 22.5, …?

Ⓐ $a_n = \frac{1}{2}(360)^{n-1}$

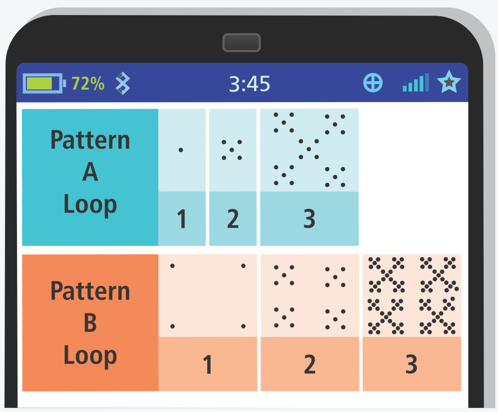
Ⓑ $a_n = \frac{1}{2}(a_{n-1})$

Ⓒ $a_n = 360(a_{n-1})$

Ⓓ $a_n = 360\left(\frac{1}{2}\right)^{n-1}$

Ⓔ $a_n = 360 + \frac{1}{2}(a_{n-1})$

46. Performance Task A computer program generates the patterns shown each time the program loops.



Part A Write the recursive formula for the geometric sequence that models each pattern.

Part B How are the geometric sequences for patterns A and B related?

Part C If pattern B has x dots at loop n, how many dots does pattern A have at loop n? Explain.