DO NOW: 1-5 REVIEW

Lesson Check

Do you know HOW?

1. What is the growth factor in the equation $y = 34 \cdot 4^x$?
2. What is the initial amount in the function $y = 15 \cdot 3^x$?
3. What is the decay factor in the function $y = 17 \cdot 0.2^x$?
4. A population of fish in a lake decreases 6% annually. What is the decay factor?
5. Suppose your friend's parents invest $20,000 in an account paying 5% interest compounded annually. What will the balance be after 10 yr?

Do you UNDERSTAND? MATHEMATICAL PRACTICES

6. **Vocabulary** How can you tell if an exponential function models growth or decay?
7. **Reasoning** How can you simplify the compound interest formula when the interest is compounded annually? Explain.
8. **Error Analysis** A student deposits $500 into an account that earns 3.5% interest compounded quarterly. Describe and correct the student's error in calculating the account balance after 2 yr.

$$A = 500\left(1 + \frac{3.5}{4}\right)^{4 \cdot 2}$$
$$= 500\,(1.875)^8$$
$$\approx 76{,}380.09$$

7.8 GEOMETRIC SEQUENCES

AGENDA FOR TODAY

- Do Now
- Intro to Geometric Sequence
- Skill 1: Identifying if it is a sequence
- Skill 2: Finding Recursive and Explicit formulas
- Skill 3: Using sequences as functions
- Practice
- Closure/ Shout out

- Objective: students will use the properties of exponential functions to find patterns in geometric sequences

INTRO TO GEOMETRIC SEQUENCE

take note

Key Concept Geometric Sequence

A geometric sequence with a *starting value* a and a *common ratio* r is a sequence of the form

$a, ar, ar^2, ar^3, \ldots$

A *recursive definition* for the sequence has two parts:

$a_1 = a$ Initial condition

$a_n = a_{n-1} \cdot r$, for $n \geq 2$ Recursive formula

An *explicit definition* for this sequence is a single formula:

$a_n = a_1 \cdot r^{n-1}$, for $n \geq 1$

Every geometric sequence has a starting value and a common ratio. The starting value and common ratio define a unique geometric sequence.

SKILL 1: IS IT A SEQUENCE?

A 20 200 2,000 20,000 200,000, . . .

B 2 4 6 8 10, . . .

C 5 −5 5 −5 5, . . .

- Rule: if it is being multiplied by the same number between each term, then it is a sequence

QUICK PRACTICE

Determine whether the sequence is a geometric sequence. Explain. See Problem 1.

10. 2, 8, 32, 128, . . .

11. 5, 10, 15, 20, . . .

12. 162, 54, 18, 6, . . .

13. 256, 192, 144, 108, . . .

14. 6, −12, 24, −48, . . .

15. 10, 20, 40, 80, . . .

Find the common ratio for each geometric sequence.

16. 3, 6, 12, 24, . . .

17. 81, 27, 9, 3, . . .

18. 128, 96, 72, 54, . . .

19. 5, 20, 80, 320, . . .

20. 7, −7, 7, −7, . . .

21. 2, −6, 18, −54, . . .

SKILL 2: RECURSIVE AND EXPLICIT FORMULAS

- Recursive:

$a_1 = a$ Initial condition

$a_n = a_{n-1} \cdot r$, for $n \geq 2$ Recursive formula

- Explicit:

$$a_n = a_1 \cdot r^{n-1}, \text{ for } n \geq 1$$

Find the recursive and explicit formulas for the sequence 7, 21, 63, 189, . . .

LET'S PRACTICE

Find the recursive and explicit formulas for each of the following.

a. 2, 4, 8, 16, . . .

b. 40, 20, 10, 5, . . .

Write a recursive formula and an explicit formula for each sequence. Find the 8th term of each sequence.

a. 14, 84, 504, 3024, . . .

b. 648, 324, 162, 81, . . .

YOU TRY…

Write the explicit formula for each geometric sequence. See Problem 2.

22. 2, 6, 18, 54, . . .

23. 3, 6, 12, 24, . . .

24. 200, 40, 8, $1\frac{3}{5}$, . . .

25. 3, −12, 48, −192, . . .

26. 8, −8, 8, −8, . . .

27. 686, 98, 14, 2, . . .

Write the recursive formula for each geometric sequence.

28. 4, 8, 16, 32, . . .

29. 1, 5, 25, 125, . . .

30. 100, 50, 25, 12.5, . . .

31. 2, −8, 32, −64, . . .

32. $-\frac{1}{36}, \frac{1}{12}, -\frac{1}{4}, \frac{3}{4}, \ldots$

33. 192, 128, $85\frac{1}{3}$, $56\frac{8}{9}$, . . .

SKILL 3: USING SEQUENCES AS FUNCTIONS

A geometric sequence has an initial value of 6 and a common ratio of 2. Write a function to represent the sequence. Graph the function.

$a_n = a_1 \cdot r^{n-1}$ Explicit formula

$f(x) = 6 \cdot 2^{x-1}$ Substitute $f(x)$ for a_n, 6 for a_1, and 2 for r.

PARTNER UP AND GRAPH!

A geometric sequence has an initial value of 18 and a common ratio of $\frac{1}{2}$. Write a function to represent this sequence. Graph the function.

EXAMPLE 2:

Two managers at a clothing store created sequences to show the original price and the marked-down prices of an item. Write a recursive formula and an explicit formula for each sequence. What will the price of the item be after the 6th markdown?

First Sequence

$60, $51, $43.35, $36.85, . . .

Second Sequence

$60, $52, $44, $36, . . .

CLOSURE

- Where would you find or use geometric sequences?
- How does this concept use the other skills we have learned in chapter 7?
- Shout out

- Objective: students will use the properties of exponential functions to find patterns in geometric sequences
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