RLP-ALG2A · RLP Algebra 2A — Sequences, Polynomials, Rational Functions and Complex Numbers

Unit 1: Sequences and Functions

Practice Workbook. The same problems, in the same order, as the Practice sections of the online lessons.

Name _____ Period _____

Lesson 1.1 — Sequences as Functions

FLUENCY

1. An arithmetic sequence has first term 14 and common difference 4. Write an explicit formula, then find term 16 and the sum of the first 16 terms.

2. An arithmetic sequence has first term −6 and common difference 1. Write an explicit formula, then find term 14 and the sum of the first 14 terms.

3. An arithmetic sequence has first term 5 and common difference 7. Write an explicit formula, then find term 14 and the sum of the first 14 terms.

4. An arithmetic sequence has first term 8 and common difference −1. Write an explicit formula, then find term 21 and the sum of the first 21 terms.

5. A geometric sequence has first term 3 and common ratio 1/2. Write an explicit formula, then find term 7 and the sum of the first 7 terms.

6. A geometric sequence has first term 6 and common ratio −2. Write an explicit formula, then find term 6 and the sum of the first 6 terms.

7. A geometric sequence has first term 4 and common ratio 2. Write an explicit formula, then find term 8 and the sum of the first 8 terms.

8. A geometric sequence has first term 6 and common ratio 2. Write an explicit formula, then find term 5 and the sum of the first 5 terms.

9. Is 4, 9, 16, 25, … arithmetic, geometric or neither? Give the evidence.

10. Is 81, 54, 36, 24, … arithmetic, geometric or neither? Write an explicit rule if you can.

APPLICATION

11. A theater's first row has 24 seats and each row has 3 more than the row in front. How many seats are in row 18, and which is the first row with at least 100 seats?

12. A ball is dropped from 150 cm and each rebound reaches 70% of the previous height. Find the height of the 5th rebound and the first rebound lower than 10 cm.

13. A Missouri tree nursery (illustrative figures) plants 40 oak seedlings in week 1 and 15 more each week than the week before. How many does it plant in week 20? Is the domain all real numbers?

CHALLENGE

14. The sequence 3, 7, 13, 21, … is neither arithmetic nor geometric. Its differences are 4, 6, 8. Find an explicit rule and the 10th term.

REVIEW

15. If $f(x) = 2x^2 + 5x - 8$, find $f(3)$.

16. If $f(x) = -2x^2 - x + 2$, find $f(3)$.

17. Write with a positive exponent: x^{-6}

18. Simplify: $x^9 \div x^4$

Lesson 1.2 — Recursive and Explicit Definitions Lab

FLUENCY

1. An arithmetic sequence has first term 8 and common difference 9. Write an explicit formula, then find term 14 and the sum of the first 14 terms.

2. An arithmetic sequence has first term −9 and common difference 9. Write an explicit formula, then find term 16 and the sum of the first 16 terms.

3. An arithmetic sequence has first term 0 and common difference −7. Write an explicit formula, then find term 9 and the sum of the first 9 terms.

4. A geometric sequence has first term 5 and common ratio 1/2. Write an explicit formula, then find term 7 and the sum of the first 7 terms.

5. A geometric sequence has first term 6 and common ratio 1/2. Write an explicit formula, then find term 8 and the sum of the first 8 terms.

6. A geometric sequence has first term 5 and common ratio 2. Write an explicit formula, then find term 7 and the sum of the first 7 terms.

7. Write an explicit rule for $a(1) = -4$, $a(n) = a(n - 1) + 6$.

8. Write an explicit rule for $g(1) = 2{,}000$, $g(n) = 0.9 \cdot g(n - 1)$, and find $g(6)$.

9. An arithmetic sequence has $a(4) = 19$ and $a(11) = 54$. Find d and $a(1)$.

10. A geometric sequence has $g(3) = 18$ and $g(6) = 486$. Find r and $g(1)$.

APPLICATION

11. Missouri's minimum wage rose from \$8.60 in 2019 by \$0.85 each year through 2023. Write a recursive and an explicit rule with $n = 1$ in 2019, and use them to find the 2023 rate.

12. For 3, 6, 12, 24, 48, 96, find the average rate of change from term 2 to term 5, and from term 4 to term 6. Why do they differ?

13. A river's salmon count (illustrative) was 8,000 in year 1 and falls 12% each year. Write recursive and explicit rules and find the count in year 6.

CHALLENGE

14. $a(1) = 1$ and $a(n) = 2a(n - 1) + 1$. List four terms, guess an explicit rule, check it satisfies the recursion, and find $a(10)$.

REVIEW

15. If $f(x) = 3x - 5$, find $f(0)$.

16. Solve: $x^2 + 3x - 28 = 0$

17. Solve: $x^2 - 17x + 72 = 0$

Lesson 1.3 — Deriving the Geometric Series Formula

FLUENCY

1. A geometric sequence has first term 1 and common ratio −2. Write an explicit formula, then find term 7 and the sum of the first 7 terms.

2. A geometric sequence has first term 4 and common ratio 3. Write an explicit formula, then find term 5 and the sum of the first 5 terms.

3. A geometric sequence has first term 6 and common ratio 2. Write an explicit formula, then find term 8 and the sum of the first 8 terms.

4. A geometric sequence has first term 4 and common ratio −2. Write an explicit formula, then find term 7 and the sum of the first 7 terms.

5. Evaluate $4 + 12 + 36 + \ldots + 4 \cdot 3^{6}$.

6. Evaluate $1/3 + 1/9 + \ldots + 1/3^{8}$ as a fraction.

7. Evaluate $100 - 50 + 25 - \ldots$ for 8 terms.

8. How many terms are in $5 + 10 + 20 + \ldots + 640$, and what is the sum?

APPLICATION

9. You save 1 cent on day 1, 2 cents on day 2, 4 cents on day 3, doubling for 30 days. What is the total, in dollars?

10. During a drought a household (illustrative) saves 10 gallons on day 1 and each day saves 5% more than the day before. How much does it save over 30 days?

11. A ball dropped from 200 cm rebounds to 60% of each height. Find the total vertical distance traveled from the drop until it lands after the 5th rebound.

CHALLENGE

12. How many terms of $3 + 6 + 12 + \ldots$ are needed for the sum to exceed 1,000,000? Justify with the formula.

REVIEW

13. Write with a positive exponent: x^{-6}

14. Simplify: $x^4 \cdot x^5$

15. Factor: $x^2 - 4x + 3$

Lesson 1.4 — Loans and Savings as Geometric Series

FLUENCY

1. A quantity starts at 1,200 and grows by 8% each year. Write a model and find its value after 10 years, to the nearest whole number.

2. A quantity starts at 8,000 and grows by 12% each year. Write a model and find its value after 11 years, to the nearest whole number.

3. A quantity starts at 1,200 and grows by 8% each year. Write a model and find its value after 6 years, to the nearest whole number.

4. Find the balance after 24 end-of-month deposits of $50 at 0.5% per month.

5. Find the balance after 60 end-of-month deposits of $200 at 0.3% per month.

6. Find the monthly payment on a $10,000 loan at 6% a year (0.5% a month) for 36 months.

7. Find the monthly payment on a $25,000 loan at 4.8% a year (0.4% a month) for 60 months.

APPLICATION

8. An $18,000 car loan at 7.2% a year (0.6% a month): compare total interest for 48 and 60 months.

9. A student wants $5,000 in 30 months for community college costs, saving at 0.4% a month. What end-of-month deposit is needed?

10. Graph $F(n) = 50(1.005^n - 1)/0.005$ and $D(n) = 50n$ for $0 \le n \le 24$ on labeled axes. How big is the gap at $n = 24$, and what does it represent?

CHALLENGE

11. A \$3,000 credit card balance charges 1.5% a month. Paying \$100 a month with no new charges, how many payments are needed? (Hint: solve $3{,}000 = 100(1 - 1.015^{-n})/0.015$.)

REVIEW

12. If $f(x) = 3x^2 + 5x - 1$, find $f(4)$.

13. Write with a positive exponent: x^{-4}

14. Solve $3x - 7 = 2(x + 4)$.

Unit 1 checkpoint

1. Which explicit rule describes 7, 11, 15, 19, …?
   A. a(n) = 7 + 4n
   B. a(n) = 7 + 4(n − 1)
   C. a(n) = 4n
   D. a(n) = 7(4)^{n − 1}
2. A geometric sequence has g(2) = 10 and g(4) = 90 with positive terms. What is g(1)?
   A. 3
   B. 10/3
   C. 30
   D. 5
3. For 2, 6, 18, 54, the average rate of change from term 1 to term 4 is _____.
4. True or false: The graph of a sequence is a set of separate points because its domain is the term positions.
5. How many terms are in 2 + 6 + 18 + … + 1,458?
   A. 6
   B. 7
   C. 8
   D. 729
6. 2 + 6 + 18 + … + 1,458 = _____.
7. True or false: The geometric series formula S = a(1 − rⁿ)/(1 − r) works when r = 1.
8. In the derivation, why do most terms cancel when you subtract rS from S?
   A. They are zero
   B. S and rS share every term except the first of S and the last of rS
   C. r is small
   D. They are negative
9. The balance after 12 end-of-month deposits of $100 at 1% a month is $_____ (nearest cent).
10. Stretching a loan from 48 to 60 months at the same rate…
    A. lowers payment and total interest
    B. lowers payment, raises total interest
    C. raises both
    D. changes nothing
11. True or false: A savings balance built by 24 deposits of $50 can be less than $1,200 at a positive rate.

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