RLP-ALG1B · RLP Algebra 1B — Functions, Exponential and Quadratic Models

Unit 2: Introduction to Exponential Functions

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

Name _____ Period _____

Lesson 2.1 — Adding or Multiplying? Linear and Exponential Change

FLUENCY

1. A quantity starts at 15,000 and grows by 2% each year. Write a model and find its value after 8 years, to the nearest whole number.

2. A quantity starts at 2,500 and grows by 3% each year. Write a model and find its value after 4 years, to the nearest whole number.

3. A quantity starts at 8,000 and grows by 5% each year. Write a model and find its value after 3 years, to the nearest whole number.

4. Is the table (0, 5), (1, 8), (2, 11), (3, 14) linear, exponential or neither?

5. Is the table (0, 5), (1, 10), (2, 20), (3, 40) linear, exponential or neither?

6. Is the table (0, 100), (1, 90), (2, 81), (3, 72.9) linear, exponential or neither?

7. Is the table (0, 2), (1, 5), (2, 10), (3, 17) linear, exponential or neither?

APPLICATION

8. Compare Plan L (1000 + 50n) and Plan E (1000(1.05)^n) after 20 years.

9. A car worth $20,000 loses 10% of its value each year. What is it worth after 5 years?

10. A Missouri town of 48,000 (illustrative) grows 2% a year. Write a model and find the population after 10 years.

CHALLENGE

11. Account A has $500 and gains $40 a year; account B has $500 and grows 6% a year. In which year does B first have more?

REVIEW

12. Write the equation, in slope-intercept form, of the line through (2, 7) and (4, 5).

13. If $f(x) = -x + 4$, find $f(2)$.

Lesson 2.2 — Sequences and Exponent Rules, Including Rational Exponents

FLUENCY

1. An arithmetic sequence has first term −3 and common difference −6. Write an explicit formula, then find term 18 and the sum of the first 18 terms.

2. An arithmetic sequence has first term 3 and common difference 4. Write an explicit formula, then find term 17 and the sum of the first 17 terms.

3. A geometric sequence has first term 5 and common ratio 3. Write an explicit formula, then find term 8 and the sum of the first 8 terms.

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

5. Simplify: $x^6 \cdot x^4$

6. Simplify: $x^9 \div x^2$

7. Evaluate: $(7x^4)^0$ for $x \neq 0$

8. Simplify: $x^{11} \div x^2$

9. Evaluate exactly: $32^{2/5}$

10. Evaluate exactly: $243^{2/5}$

11. Evaluate exactly: $128^{3/7}$

12. Evaluate exactly: $81^{-3/2}$

APPLICATION

13. An outdoor amphitheater has 24 seats in row 1 and 3 more in each row after. Write recursive and explicit rules and find the seats in row 15.

14. A culture of 50 bacteria doubles every hour. Write an explicit rule for the count after n doublings and find it after 8 doublings.

15. Rewrite $\sqrt{(x^3)}$ and $\sqrt[3]{(x^2)} \cdot x$ with rational exponents.

CHALLENGE

16. Evaluate 27^(2/3) two ways and explain why they agree.

REVIEW

17. Solve and graph on a number line: $-3x + 8 > 2$

18. Solve the system: $-x - 2y = -6$ and $-4x + 4y = -12$

Lesson 2.3 — Reading the Rate: Interpreting and Rewriting Exponential Expressions

FLUENCY

1. A quantity starts at 2,500 and decreases by 8% each year. Write a model and find its value after 6 years, to the nearest whole number.

2. A quantity starts at 500 and decreases by 5% each year. Write a model and find its value after 6 years, to the nearest whole number.

3. A quantity starts at 1,200 and decreases by 3% each year. Write a model and find its value after 7 years, to the nearest whole number.

4. A quantity starts at 2,500 and grows by 4% each year. Write a model and find its value after 9 years, to the nearest whole number.

5. A quantity starts at 1,200 and grows by 5% each year. Write a model and find its value after 3 years, to the nearest whole number.

6. What percent change per year does the factor 0.85 represent? The factor 1.035?

7. Write the factor for a 7% decrease per unit and for a 12% increase.

APPLICATION

8. A savings account grows 6% a year. What is the equivalent monthly growth rate, to three decimal places of a percent?

9. A medication (illustrative) has a half-life of 8 hours, starting at 400 mg. Write M(t), find M(20), and find the percent lost each hour.

10. In V(n) = 24,000(0.85)^n for a car's value, interpret 24,000 and 0.85.

CHALLENGE

11. Is 2% growth per month more or less than 26% growth per year?

REVIEW

12. Find the slope of the line through (−2, 9) and (−3, 5).

13. For the data 3, 8, 10, 16, 19, 30, 31, 33: find the mean, median, range and interquartile range. (Find the quartiles as the medians of the lower and upper halves, leaving out the overall median when the count is odd.)

Lesson 2.4 — Building and Graphing Exponential Models

FLUENCY

1. A quantity starts at 2,500 and grows by 5% each year. Write a model and find its value after 10 years, to the nearest whole number.

2. A quantity starts at 500 and grows by 3% each year. Write a model and find its value after 9 years, to the nearest whole number.

3. Find the exponential function through (0, 3) and (1, 12).

4. Find the exponential function through (1, 6) and (3, 54).

5. Find the exponential function through (2, 100) and (4, 25).

6. Find the exponential function through (0, 64) and (2, 36).

APPLICATION

7. Compost collected follows C(w) = 40(1.5)^w kilograms (illustrative). How much in week 4?

8. In what year does 1000(1.05)^n first exceed 1000 + 100n?

9. Describe the graph of g(x) = 64(0.75)^x: intercept, direction, asymptote and end behavior.

CHALLENGE

10. An exponential function passes through (1, 12) and (4, 96). Find it, then find x where f(x) = 384.

REVIEW

11. Solve the system: $2x + 5y = 19$ and $-4x + 2y = -2$

12. Solve: $2(x + 7) + 10 = 40$

Unit 2 checkpoint

1. Which is exponential?
   A. (0, 5), (1, 10), (2, 20)
   B. (0, 5), (1, 8), (2, 11)
   C. (0, 2), (1, 5), (2, 10)
   D. (0, 1), (1, 1), (2, 1)
2. True or false: Linear functions change by equal differences over equal intervals.
3. 8^(2/3) = _____.
4. 2^(−3) = 1/_____.
5. Explicit rule for 3, 6, 12, 24, …?
   A. $a_n = 3 \cdot 2^{(n - 1)}$
   B. $a_n = 3 \cdot 2^n$
   C. $a_n = 3 + 3(n - 1)$
   D. $a_n = 2 \cdot 3^{(n - 1)}$
6. In 500(0.92)^t, each unit of time the amount…
   A. decreases 8%
   B. decreases 92%
   C. decreases 0.92
   D. increases 8%
7. 15% a year is about what monthly rate?
   A. 1.17%
   B. 1.25%
   C. 15%
   D. 0.15%
8. For M(t) = 200(0.5)^(t/6), M(12) = _____.
9. The exponential through (2, 180) and (4, 405) has b = _____.
10. True or false: An exponential function ab^x with a > 0 has an x-intercept.
11. $1,000 + $100/year versus 5%/year from $1,000: the exponential first leads in year…
    A. 27
    B. 3
    C. 10
    D. never
12. True or false: A factor of 1.035 means 35% growth per unit.