Unit 4 Comprehensive Review – Version 1

Directions: Show all work. Use exact values. Box or circle all answers.

Section A – Geometric Sequences and Growth/Decay

1. Find the common ratio and write the next three terms: $5, 15, 45, 135, \ldots$

2. Find the common ratio and write the next three terms: $160, 80, 40, 20, \ldots$

3. Determine whether the sequence is geometric. If it is, find the common ratio: $7, -14, 28, -56, \ldots$

4. Determine whether the sequence is geometric. If it is, find the common ratio: $3, 9, 27, 80, \ldots$

5. A geometric sequence has $a_1 = -4$ and common ratio $r = -3$. Write the first 5 terms.

6. A geometric sequence has $a_1 = 243$ and common ratio $r = \frac{1}{3}$. Write the first 5 terms.

7. A geometric sequence has $a_1 = 5$ and $r = 2$. Find a_6.

8. A geometric sequence has $a_1 = 320$ and $r = \frac{1}{4}$. Find a_5.

9. A quantity is 9 at the end of hour 1 and doubles each hour. find the value at the end of 6 hours.

10. A quantity is 256 at the end of year 1 and increases by 25% each year. State the common ratio and find the value at the end of 4 years.

11. A quantity is 1250 at the end of hour 1 and decreases by 20% each hour. State the common ratio and find the value at the end of 5 hours.

12. A quantity is 810 at the end of day 1 and loses one third of its value each day. State the common ratio and find the value at the end of 5 days.

Section B – Recursive Formulas

13. Write a recursive formula to represent the sequence $3, 9, 27, 81, ...$

14. Write a recursive formula to represent the sequence $160, 80, 40, 20, ...$

15. Write a recursive formula to represent the sequence $4, -8, 16, -32, ...$

16. Write the first 6 terms of the sequence if $a_1 = 4,\ a_n = 3a_{n-1}$.

17. Write the first 5 terms of the sequence if $a_1 = 96,\ a_n = \frac{1}{2}a_{n-1}$.

18. Write the first 5 terms of the sequence if $a_1 = 5,\ a_n = -2a_{n-1}$.

19. The table shows the number of bacteria in a culture at the end of each hour.

Hour	1	2	3	4
Bacteria	12	36	108	324

Find the common ratio and write a recursive formula to model the situation. Do not forget to include the first term.

20. The table shows the value of a machine at the end of each year.

Year	1	2	3	4
Machine Value	6400	3200	1600	800

Find the common ratio and write a recursive formula to model the situation. Do not forget to include the first term.

21. A quantity has 80 at the end of hour 1 and increases by 25% each hour. Write a recursive formula.

22. A quantity has 1800 at the end of hour 1 and decreases by 20% each hour. Write a recursive formula.

23. A quantity has 30 at the end of day 1 and triples each day. Write a recursive formula.

24. A sequence has recursive formula $a_1 = 243,\ a_n = \frac{1}{3}a_{n-1}$. What is the common ratio? Write the first 5 terms.

Section C – Explicit Formulas and Exponential Models

25. Write an explicit formula for the geometric sequence $4, 8, 16, 32, \ldots$.

26. Write an explicit formula for the geometric sequence $96, 48, 24, 12, \ldots$.

27. Write an explicit formula for the geometric sequence $5, -15, 45, -135, \ldots$.

28. Convert the recursive formula to an explicit formula: $a_1 = 7,\ a_n = 4a_{n-1}$.

29. Convert the recursive formula to an explicit formula: $a_1 = 243,\ a_n = \frac{1}{3}a_{n-1}$.

30. Convert the explicit formula to a recursive formula: $a_n = 6(5)^{n-1}$. Include the first term.

31. Convert the explicit formula to a recursive formula: $a_n = 80(-\frac{1}{2})^{n-1}$. Include the first term.

32. The table shows the number of cells in a culture for hours 1 through 4.

Hour	1	2	3	4
Cells	6	18	54	162

Find the common ratio, write an explicit formula, and find the value at 6.

33. The table shows the value of a machine for years 1 through 4.

Year	1	2	3	4
Value	3200	1600	800	400

Find the common ratio, write an explicit formula, and find the value at 6.

34. A geometric sequence has $a_3 = 20$ and $a_6 = 160$. Find the common ratio and write an explicit formula for the sequence.

35. A geometric sequence has $a_2 = 81$ and $a_5 = 3$. Find the common ratio and write an explicit formula for the sequence.

36. For $y = f(x) = (500)(1.08)^x$, identify the y-intercept and common ratio. At what percentage is the function growing or decaying? Is it growth or decay?

37. For $y = f(x) = (1200)(0.75)^x$, identify the y-intercept and common ratio. At what percentage is the function growing or decaying? Is it growth or decay?

38. A bacteria culture has 200 when the situation begins and increases by 50% each period. Write an exponential equation to model the quantity at any given time. Find the value after 3 periods.

39. A machine value has 1000 when the situation begins and decreases by 20% each period. Write an exponential equation to model the quantity at any given time. Find the value after 3 periods.

40. y-intercept = 7; common ratio = 3. Write an explicit equation for the exponential function.

41. y-intercept = -4; common ratio = $\frac{1}{2}$. Write an explicit equation for the exponential function.

42. Point: $(2, 18)$; common ratio = 3. Write 2 different explicit equations that represent the same exponential function.

43. Point: $(3, 16)$; common ratio = 2. Write 3 different explicit equations that represent the same exponential function.

44. Point: $(2, 12)$; common ratio = $\frac{1}{2}$. Write 3 different explicit equations that represent the same exponential function.

Section D – Solving Basic Exponential Equations

45. Solve $2^x = 128$.

46. Solve $5^x = \frac{1}{125}$.

47. Solve $9^x = 729$.

48. Solve $4^x = \frac{1}{64}$.

49. Solve $3^{2x+1} = 243$.

50. Solve $2^{3x-2} = 32$.

51. Solve $5^{x+2} = 3125$.

52. Solve $4^{5x-3} = 4^{x+9}$.

53. Solve $3^{6x+1} = 3^{2x+13}$.

54. Solve $4 \cdot 3^x = 324$.

55. Solve $5 \cdot 2^{x+1} = 320$.

56. Solve $2 \cdot 5^{2x} = 1250$.