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Practice

Form G

Properties of Logarithms

Write each expression as a single logarithm.

1. $\log_5 4 + \log_5 3$

2. $\log_6 25 - \log_6 5$

3. $\log_2 4 + \log_2 2 - \log_2 8$

4. $5 \log_7 x = 2 \log_7 x$

5. $\log_4 60 - \log_4 4 + \log_4 x$

6. $\log 7 - \log 3 + \log 6$

7. $2 \log x - 3 \log y$

8. $\frac{1}{2} \log r + \frac{1}{3} \log s - \frac{1}{4} \log t$

9. $\log_3 4x + 2 \log_3 5y$

10. $5 \log 2 - 2 \log 2$

11. $\frac{1}{3} \log 3x + \frac{2}{3} \log 3x$

12. $2 \log 4 + \log 2 + \log 2$

13. $(\log 3 - \log 4) - \log 2$

14. $5 \log x + 3 \log x^2$

15. $\log_6 3 - \log_6 6$

16. $\log 2 + \log 4 - \log 7$

17. $\log_3 2x - 5 \log_3 y$

18. $\frac{1}{2}(\log_2 x - \log_2 y)$

19. $\frac{1}{2} \log x + \frac{1}{3} \log y - 2 \log z$

20. $3(4 \log t^2)$

21. $\log_5 y - 4(\log_5 r + 2 \log_5 t)$

Expand each logarithm. Simplify if possible.

22. $\log xyz$

23. $\log_2 \frac{x}{yz}$

24. $\log 6x^3y$

25. $\log 7(3x - 2)^2$

26. $\log \sqrt{\frac{2rst}{5w}}$

27. $\log \frac{5x}{4y}$

28. $\log_5 5x^{-5}$

29. $\log \frac{2x^2y}{3k^3}$

30. $\log_4 (3xyz)^2$

Use the Change of Base Formula to evaluate each expression. Round your answer to the nearest thousandth.

31. $\log_4 32$

32. $\log_3 5$

33. $\log_2 15$

34. $\log_6 17$

35. $\log_6 10$

36. $\log_5 6$

37. $\log_8 1$

38. $\log_9 11$

39. The concentration of hydrogen ions in a batch of homemade ketchup is 10^{-4} . What is the pH level of the ketchup?

7-4

Practice (continued)

Form G

Properties of Logarithms

Determine if each statement is *true* or *false*. Justify your answer.

40. $\log 12 = \log 4 + \log 3$

41. $\log \frac{3}{5} = \frac{\log 3}{\log 5}$

42. $\log_6 12 + \log_6 3 = 2$

43. $\frac{1}{2} \log_4 4x = \log_4 2x$

Use the properties of logarithms to evaluate each expression.

44. $\log_2 8 + \log_2 4$

45. $\log_2 160 - \log_2 5$

46. $\log_6 27 + \log_6 8$

47. $\log_7 14 - \log_7 2$

48. $\log_4 64 + 2 \log_4 2$

49. $\frac{1}{4} \log_3 162 - \log_3 \sqrt[4]{2}$

State the property or properties used to rewrite each expression.

50. $\log 6 - \log 3 = \log 2$

51. $6 \log 2 = \log 64$

52. $\log 3x = \log 3 + \log x$

53. $\frac{1}{3} \log_2 x = \log_2 \sqrt[3]{x}$

54. $\frac{2}{3} \log 7 = \log \sqrt[3]{49}$

55. $\log_4 20 - 3 \log_4 x = \log_4 \frac{20}{x^3}$

The formula for loudness in decibels (dB) is $L = 10 \log \frac{I}{I_0}$, where I is the intensity of a sound in watts per square meter (W/m^2) and I_0 is $10^{-12} \text{ W}/\text{m}^2$, the intensity of a barely audible sound.

56. A sound has an intensity of $5.92 \times 10^{25} \text{ W}/\text{m}^2$. What is the loudness of the sound in decibels? Use $I_0 = 10^{-12} \text{ W}/\text{m}^2$.

57. Suppose you decrease the intensity of a sound by 45%. By how many decibels would the loudness be decreased?

58. **Writing** Explain why $\left(\frac{9}{4}\right) \neq \frac{\log 9}{\log 4}$.