Name _____ Date _____ Class _____

LESSON 7-4

Practice B

Properties of Logarithms

Express as a single logarithm. Simplify, if possible.

1. $\log_3 9 + \log_3 27$ _____
2. $\log_2 8 + \log_2 16$ _____
3. $\log_{10} 80 + \log_{10} 125$ _____
4. $\log_6 8 + \log_6 27$ _____
5. $\log_3 6 + \log_3 13.5$ _____
6. $\log_4 32 + \log_4 128$ _____

Express as a single logarithm. Simplify, if possible.

7. $\log_2 80 - \log_2 10$ _____
8. $\log_{10} 4000 - \log_{10} 40$ _____
9. $\log_4 384 - \log_4 6$ _____
10. $\log_2 1920 - \log_2 30$ _____
11. $\log_3 486 - \log_3 2$ _____
12. $\log_6 180 - \log_6 5$ _____

Simplify, if possible.

13. $\log_4 4^6$ _____
14. $\log_5 5^{x-5}$ _____
15. $7^{\log_7 30}$ _____
16. $12^{\log_{12} 1}$ _____
17. $\log_8 8^5$ _____
18. $\log_3 9^4$ _____

Evaluate. Round to the nearest hundredth.

19. $\log_{12} 1$ _____
20. $\log_3 30$ _____
21. $\log_5 10$ _____

Solve.

22. The Richter magnitude of an earthquake, M, is related to the energy released in ergs, E, by the formula $M = \frac{2}{3}\log\left(\frac{E}{10^{11.8}}\right)$. Find the energy released by an earthquake of magnitude 4.2. _____

Reading Strategies

1. $4^2 = 16$; $\log_5 0.2 = -1$; $\log_6 1 = 0$
2. $\log_b 1 = 0$ is the same as $b^0 = 1$ and any number to the 0 power is 1.
3. $f^{-1}(x) = \log_4 x$
4. a. $g^{-1}(x) = \log_{\frac{1}{2}} x$

   b. Domain of $g(x)$ is all real numbers
   range of $g(x)$ is $y > 0$
   domain of $g^{-1}(x)$ is $x > 0$
   range of $g^{-1}(x)$ is all real numbers.

LESSON 7-4

Practice A

1. 4
2. 64; 64; 6
3. 3125; 3125; 5
4. $\log_{10} 10{,}000 = 4$
5. $\log_6 6 = 1$
6. $\log_8 64 = 2$
7. $\log_5 25 = 2$
8. $\log_3 3 = 1$
9. $\log_2 32 = 5$
10. $\log_4 16 = 2$
11. $\log_6 36 = 2$
12. $\log_5 125 = 3$
13. 4
14. 4
15. 9
16. 4
17. 12
18. 2
19. 1.59
20. 1.77
21. 1.46
22. 10^{22} ergs

Practice B

1. $\log_3 243 = 5$
2. $\log_2 128 = 7$
3. $\log_{10} 10{,}000 = 4$
4. $\log_6 216 = 3$
5. $\log_3 81 = 4$
6. $\log_4 4096 = 6$
7. $\log_2 8 = 3$
8. $\log_{10} 100 = 2$
9. $\log_4 64 = 3$
10. $\log_2 64 = 6$
11. $\log_3 243 = 5$
12. $\log_6 36 = 2$
13. 6
14. $x - 5$
15. 30
16. 1
17. 5
18. 8
19. 0
20. 3.10
21. 1.43
22. $1.26 \times 10^{18.1}$ ergs

Practice C

1. $\log_6 216 = 3$
2. $\log_3 3 = 1$
3. $\log_4 16 = 2$
4. $\log_6 1296 = 4$
5. $\log_5 125 = 3$
6. $\log_8 32{,}768 = 5$
7. $\log_5 625 = 4$
8. $\log_2 4 = 2$
9. $\log_3 81 = 4$
10. $\log_8 4096 = 4$
11. $\log_7 7 = 1$
12. $\log_{10} 10{,}000 = 4$
13. 6
14. 8^x
15. 20
16. $2x + 1$
17. $2x - 2$
18. 17
19. 2.93
20. -6
21. -12
22. 4.32
23. 6
24. 3.32
25. a. $\log_{1.06} 1.6$

    b. 8 years

Reteach

1. 3
2. $\log_2 16$; 4
3. $\log_9 (3 \cdot 27)$; $\log_9 81$; 2
4. $2 \cdot 3 = 6$
5. $4 \cdot 4 = 16$
6. $3 \log_9 81$; $3 \cdot 2 = 6$
7. $5y$
8. 75
9. $3x$

Challenge

1. Both expressions equal $\frac{3}{2}$.
2. Result is $\frac{3}{2}$; formula is easier to compute.
3. Result is $\frac{6}{5}$; formula is easier to compute.
4. $\log_a b \cdot \log_b c = \log_a c$

   $$\log_a b \cdot \log_b c = \frac{\log b}{\log a} \cdot \frac{\log c}{\log b}$$

   $$= \frac{\log c}{\log a} \cdot \frac{\log b}{\log b} = \frac{\log c}{\log a} = \log_a c$$

5. $\log_2 13 = \frac{\log 13}{\log 2} \approx 3.7$
6. $\log_2 32 = 5$; possible answer: using the Chain Rule is much easier.