

# Practice 22

FOR USE WITH SECTION 4.3

Write each expression in terms of  $\log_3 a$ ,  $\log_3 b$ , and  $\log_3 c$ .

- |                         |                              |                               |                                  |
|-------------------------|------------------------------|-------------------------------|----------------------------------|
| 1. $\log_3 a^5$         | 2. $\log_3 b^{1/2}$          | 3. $\log_3 ac^2$              | 4. $\log_3 \frac{b^{2/3}}{c^5}$  |
| 5. $\log_3 a^6 b^{1/4}$ | 6. $\log_3 \frac{ab^3}{c^4}$ | 7. $\log_3 \frac{a^7}{b^3 c}$ | 8. $\log_3 \frac{(ab)^{1/4}}{c}$ |

Write as a logarithm of a single number or expression.

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|--|---|
| 9. $\frac{1}{2} \log_5 144$            | 10. $5 \log_b 2 + \log_b 3$                           |
| 11. $\log_7 10 - 4 \log_7 5$           | 12. $3(\log_6 2 + \log_6 5)$                          |
| 13. $\frac{3}{4} \log_3 16 + \log_3 6$ | 14. $2 \log_{11} x^3 - \log_{11} x^2$                 |
| 15. $5 \log a + 2 \log b - 3 \log c$   | 16. $\frac{3}{2} \log_2 a^2 - \frac{5}{3} \log_2 b^3$ |

Let  $x = \log_b 3$  and  $y = \log_b 5$ . Write each expression in terms of  $x$  and  $y$ .

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|-----------------|--------------------------|--------------------------|--------------------------|
| 17. $\log_b 15$ | 18. $\log_b \frac{1}{5}$ | 19. $\log_b \frac{5}{3}$ | 20. $\log_b 25$          |
| 21. $\log_b 81$ | 22. $\log_b 3\sqrt{5}$   | 23. $\log_b 5b^2$        | 24. $\log_b \frac{b}{3}$ |

25. The *magnitude* of a star is a measure of how bright the star appears in the night sky. Brighter stars have *smaller* magnitudes, and the magnitudes of the brightest stars are negative. Let  $B_0$  = the brightness of a star of magnitude 0. Then the magnitude  $M$  of a star of brightness  $B$  is given by the formula

$$M = 2.5 \log \frac{B_0}{B}.$$

- Suppose a star has a brightness  $0.01B_0$ . (That is, the star is 100 times dimmer than a star of magnitude 0.) What is its magnitude?
- Two of the brightest stars, Canopus and Vega, have magnitudes of  $-0.72$  and  $0.04$ , respectively. How many times brighter is Canopus than Vega? (Hint: Let  $B_1$  and  $B_2$  be the brightnesses of Canopus and Vega. Subtract.)