LESSON 8.4

NAME _____ DATE _____

# Practice B

**For use with pages 486–492**

**Rewrite the equation in exponential form.**

1. $\log_4 16 = 2$
2. $\log_3 81 = 4$
3. $\log_2 1 = 0$
4. $\log_9 3 = \frac{1}{2}$
5. $\log_5 \frac{1}{5} = -1$
6. $\log_2 \frac{1}{8} = -3$

**Use a calculator to evaluate the expression. Round the result to three decimal places.**

7. $\ln \sqrt{3}$
8. $\log 11.5$
9. $\ln \left(\frac{2}{3}\right)$

**Evaluate the logarithm without using a calculator.**

10. $\log_3 27$
11. $\log_4 1$
12. $\log_2 \frac{1}{2}$
13. $\log_8 2$
14. $\log_5 5^{2/3}$
15. $\log_6 (-1)$

**Find the inverse of the function.**

16. $f(x) = \log_3 x$
17. $f(x) = \ln x$
18. $f(x) = \log_{1/3} x$
19. $f(x) = \log 2x$
20. $f(x) = \log_2 (x - 1)$
21. $f(x) = \log_4 16x$

**Graph the function.**

22. $f(x) = \log_6 x$
23. $f(x) = 1 + \log_6 x$
24. $f(x) = \log_6 (x + 1)$
25. $f(x) = -\log_6 x$
26. $f(x) = \log_6 (2x)$
27. $f(x) = -1 + \log_6 x$

28. ***Galloping Speed*** Four-legged animals run with two different types of motion: trotting and galloping. An animal that is trotting has at least one foot on the ground at all times. An animal that is galloping has all four feet off the ground at times. The number $s$ of strides per minute at which an animal breaks from a trot to a gallop is related to the animal's weight $w$ (in pounds) by the model

$$S = 256.2 - 47.9 \log w.$$

Approximate the number of strides per minute for a 500 pound horse when it breaks from a trot to a gallop.

29. ***Tornadoes*** The wind speed $S$ (in miles per hour) near the center of a tornado is related to the distance $d$ (in miles) the tornado travels by the model

$$S = 93 \log d + 65.$$

Approximate the wind speed of a tornado that traveled 150 miles.

Lesson 8.4





LESSON 8.5

NAME _____ DATE _____

# Practice B

**For use with pages 493–499**

Lesson 8.5

**Use the properties of logarithms to rewrite the expression in terms of log 3 and log 4. Then use log 3 ≈ 0.477 and log 4 ≈ 0.602 to approximate the expression.**

1. $\log \left(\frac{3}{4}\right)$
2. $\log 12$
3. $\log 9$
4. $\log 16$
5. $\log \frac{1}{4}$
6. $\log \left(\frac{4}{27}\right)$

**Expand the expression.**

7. $\log_6 3x$
8. $\log_2 \frac{x}{5}$
9. $\log xy^2$
10. $\log_4 \frac{xy}{3}$
11. $\log_3 \sqrt{x}\, y\, z$
12. $\log_5 2\sqrt{x}$
13. $\log \frac{x^2}{4}$
14. $\log \frac{10}{\sqrt{x}}$
15. $\log_2 \frac{x^2 y}{z}$

**Condense the expression.**

16. $\log_3 7 - \log_3 x$
17. $2 \log_5 x + \log_5 3$
18. $\log_4 5 + \log_4 x + \log_4 y$
19. $\frac{1}{2} \log x - \log 4$
20. $\frac{2}{3} \log_2 x - 3 \log_2 y$
21. $\log_3 4 + 2 \log_3 x - \log_3 5$

**Use the change-of-base formula to rewrite the expression. Then use a calculator to evaluate the expression. Round your result to three decimal places if necessary.**

22. $\log_3 12$
23. $\log_6 2$
24. $\log_4 0.5$
25. $\log_{0.8} 12$
26. $\log_{1.5} 2.8$
27. $\log_{1/2} 6$

***Henderson-Hasselbach Formula*** **In Exercises 28–32, use the following information.**

The pH of a patient's blood can be calculated using the Henderson-Hasselbach Formula, $pH = 6.1 + \log \frac{B}{C}$, where $B$ is the concentration of bicarbonate and $C$ is the concentration of carbonic acid. The normal pH of blood is approximately 7.4.

28. Expand the right side of the formula.
29. A patient has a bicarbonate concentration of 24 and a carbonic acid concentration of 1.9. Find the pH of the patient's blood.
30. Is the patient's pH in Exercise 29 below normal or above normal?
31. A patient has a bicarbonate concentration of 24. Graph the model.
32. Use the graph to approximate the concentration of carbonic acid required for the patient to have normal blood pH.

LESSON 8.6

NAME _____ DATE _____

# Practice B

For use with pages 501–508



**Solve the exponential equation. Round the result to three decimal places if necessary.**

1. $e^x = 18$
2. $10^x = 350$
3. $e^{2x} = 42$
4. $e^x + 3 = 8$
5. $2^x + 7 = 10$
6. $5^{2x} = 8$
7. $2^{3x} = 4$
8. $e^{2x} = 5$
9. $3^{2x} - 3 = 4$
10. $e^{3x} + 6 = 10$
11. $e^{4x} - 3 = 7$
12. $2^{-x} + 1 = 6$
13. $4^{-2x} - 3 = 1$
14. $e^{-2x} + 5 = 12$
15. $e^{-x} - 6 = 1$
16. $2e^x = 10$
17. $4(2^x) = 16$
18. $3e^{-x} = 18$
19. $2e^{4x} = 5$
20. $3e^{5x} = 14$
21. $2(2^{3x}) = 2$
22. $-4e^{2x} + 3 = -5$
23. $-3e^{-x} - 4 = -13$
24. $2^{0.1x} + 6 = 12$
25. $\frac{1}{3}e^x + 1 = 5$
26. $\frac{2}{3}e^{2x} = 12$
27. $\frac{3}{8}(2^{3x}) + 1 = 10$

**Solve the logarithmic equation. Round the result to three decimal places if necessary.**

28. $\ln x = 5$
29. $\log_{10} x = -2$
30. $\log_2 x = 1.5$
31. $7 \ln x = 21$
32. $2 \log_{10} x = 10$
33. $7 + \log_{10} x = 4$
34. $-3 + \ln x = 5$
35. $4 - \ln x = 1$
36. $-5 + 2 \ln x = 5$
37. $3 \log_{10} x + 1 = 13$
38. $9 \log_{10} x - 4 = 11$
39. $\log_3 3x = 2$
40. $\log_2 5x = 1$
41. $2 + \log_3 2x = -3$
42. $\ln 4x - 6 = 8$
43. $2 + \log_2 3x = 8$
44. $\log_2 (x + 2) = \log_2 3x$
45. $\log_3 (2x + 1) = \log_3 (x - 4)$
46. $\ln (5x - 1) = \ln (3x + 2)$
47. $\ln (2x + 3) = \ln (2x - 1)$
48. $\ln (4x - 9) = \ln x$

49. ***Compound Interest*** You deposit \$2000 into an account that pays 2% annual interest compounded quarterly. How long will it take for the balance to reach \$2500?

50. ***Rocket Velocity*** Disregarding the force of gravity, the maximum velocity $v$ of a rocket is given by $v = t \ln M$, where $t$ is the velocity of the exhaust and $M$ is the ratio of the mass of the rocket with fuel to its mass without fuel. A solid propellant rocket has an exhaust velocity of 2.5 kilometers per second. Its maximum velocity is 7.5 kilometers per second. Find its mass ratio $M$.





LESSON 8.7

NAME _____ DATE _____

# Practice B

For use with pages 509–516



**Write an exponential function of the form $y = ab^x$ whose graph passes through the given points.**

1. $\left(1, \frac{2}{3}\right), \left(2, \frac{4}{3}\right)$
2. $\left(2, \frac{16}{25}\right), \left(3, \frac{64}{25}\right)$
3. $\left(2, \frac{3}{4}\right), \left(3, \frac{3}{8}\right)$
4. $(1, 4), \left(2, \frac{8}{3}\right)$
5. $\left(1, \frac{5}{2}\right), \left(2, \frac{25}{2}\right)$
6. $\left(2, \frac{5}{36}\right), \left(3, \frac{5}{108}\right)$

**Use the table of values to draw a scatter plot of ln $y$ versus $x$. Then find an exponential model for the data.**

7.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 8 | 16 | 32 | 64 | 128 | 256 | 512 | 1024 |

8.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 3.6 | 8.64 | 20.736 | 49.766 | 119.439 | 286.654 | 687.971 | 1651.13 |

9.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 3 | 4.5 | 6.75 | 10.125 | 15.188 | 22.781 | 34.172 | 51.258 |

**Write a power function of the form $y = ax^b$ whose graph passes through the given points.**

10. (2, 16), (3, 36)
11. (2, 4), (4, 32)
12. (2, 64), (3, 486)
13. (4, 9.6), (9, 32.4)
14. (4, 384), (16, 49,152)
15. (2, 9.879), (3, 16.070)

**Use the table of values to draw a scatter plot of ln $y$ versus ln $x$. Then find a power model for the data.**

16.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 1.5 | 6 | 13.5 | 24 | 37.5 | 54 | 73.5 | 96 |

17.

| $x$ | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| $y$ | 2.4 | 7.275 | 13.919 | 22.055 | 31.518 | 42.194 | 53.997 | 66.858 |

18. ***Consumer Magazines*** The table shows the circulation of the top 10 consumer magazines in 1997 where $x$ represents the magazine's ranking. Use a graphing calculator to find a power model for the data. Use the model to estimate the circulation of the 15th ranked magazine.

| *Rank* | *Circulation (millions)* | *Rank* | *Circulation (millions)* |
|---|---|---|---|
| 1 | 20.454 | 6 | 7.615 |
| 2 | 20.432 | 7 | 5.054 |
| 3 | 15.086 | 8 | 4.643 |
| 4 | 13.171 | 9 | 4.514 |
| 5 | 9.013 | 10 | 4.256 |