Name _____ Date _____ Class _____

LESSON 7-3

Practice A

Logarithmic Functions

Write each exponential equation in logarithmic form.

1. $7^3 = 343$

$\log_{base} 343 = \text{exponent}$

$\log_7 343 =$ _____

2. $2^6 = 64$

$\log_{base} 64 = \text{exponent}$

$\log_2 64 =$ _____

3. $15^2 = 225$

$\log_{base} 225 = \text{exponent}$

$\log_{15} 225 =$ _____

4. $2^3 = 8$

_____

5. $17^0 = 1$

_____

6. $1^{12} = 1$

_____

7. $4^5 = 1024$

_____

8. $3^6 = 729$

_____

9. $5^4 = 625$

_____

Write each logarithmic equation in exponential form.

10. $\log_4 64 = 3$

$\log_{base} 64 = \text{exponent}$

_____ $= 64$

11. $\log_8 512 = 3$

$\log_{base} 512 = \text{exponent}$

_____ $= 512$

12. $\log_6 36 = 2$

$\log_{base} 36 = \text{exponent}$

_____ $= 36$

13. $\log_{10} 100 = 2$

_____

14. $\log_5 125 = 3$

_____

15. $\log_9 1 = 0$

_____

16. $\log_2 128 = 7$

_____

17. $\log_3 243 = 5$

_____

18. $\log_{100} 1{,}000{,}000 = 3$

_____

Evaluate by using mental math.

19. log 10,000

$10^4 = 10{,}000$

log 10,000 = _____

20. log 100,000

$10^5 = 100{,}000$

log 100,000 = _____

21. log 1

$10^0 = 1$

log 1 = _____

22. $\log_2 16$

_____

23. $\log_4 1$

_____

24. $\log_9 81$

_____

25. $\log_{100} 100{,}000{,}000$

_____

26. log 1,000,000,000

_____

27. $\log_3 81$

_____

28. $\log_4 64$

_____

29. $\log_5 25$

_____

30. log 1000

_____

LESSON 7-3

Practice A

Logarithmic Functions

Write each exponential equation in logarithmic form.

1. $7^3 = 343$

$\log_{base}\ 343 = \text{exponent}$

$\log_7 343 =$ 3

2. $2^6 = 64$

$\log_{base}\ 64 = \text{exponent}$

$\log_2 64 =$ 6

3. $15^2 = 225$

$\log_{base}\ 225 = \text{exponent}$

$\log_{15} 225 =$ 2

4. $2^3 = 8$ — $\log_2 8 = 3$

5. $17^0 = 1$ — $\log_{17} 1 = 0$

6. $1^{12} = 1$ — $\log_1 1 = 12$

7. $4^5 = 1024$ — $\log_4 1024 = 5$

8. $3^6 = 729$ — $\log_3 729 = 6$

9. $5^4 = 625$ — $\log_5 625 = 4$

Write each logarithmic equation in exponential form.

10. $\log_4 64 = 3$

$\log_{base}\ 64 = \text{exponent}$

$4^3 = 64$

11. $\log_8 512 = 3$

$\log_{base}\ 512 = \text{exponent}$

$8^3 = 512$

12. $\log_6 36 = 2$

$\log_{base}\ 36 = \text{exponent}$

$6^2 = 36$

13. $\log_{10} 100 = 2$ — $10^2 = 100$

14. $\log_5 125 = 3$ — $5^3 = 125$

15. $\log_9 1 = 0$ — $9^0 = 1$

16. $\log_2 128 = 7$ — $2^7 = 128$

17. $\log_3 243 = 5$ — $3^5 = 243$

18. $\log_{100} 1{,}000{,}000 = 3$ — $100^3 = 1{,}000{,}000$

Evaluate by using mental math.

19. log 10,000

$10^4 = 10{,}000$

$\log 10{,}000 =$ 4

20. log 100,000

$10^5 = 100{,}000$

$\log 100{,}000 =$ 5

21. log 1

$10^0 = 1$

$\log 1 =$ 0

22. $\log_2 16$ — 4

23. $\log_4 1$ — 0

24. $\log_9 81$ — 2

25. $\log_{100} 100{,}000{,}000$ — 4

26. log 1,000,000,000 — 9

27. $\log_3 81$ — 4

28. $\log_4 64$ — 3

29. $\log_5 25$ — 2

30. log 1000 — 3

LESSON 7-3

Practice B

Logarithmic Functions

Write each exponential equation in logarithmic form.

1. $3^7 = 2187$ — $\log_3 2187 = 7$

2. $12^2 = 144$ — $\log_{12} 144 = 2$

3. $5^3 = 125$ — $\log_5 125 = 3$

Write each logarithmic equation in exponential form.

4. $\log_{10} 100{,}000 = 5$ — $10^5 = 100{,}000$

5. $\log_4 1024 = 5$ — $4^5 = 1024$

6. $\log_9 729 = 3$ — $9^3 = 729$

Evaluate by using mental math.

7. log 1,000,000 — 6

8. log 10 — 1

9. log 1 — 0

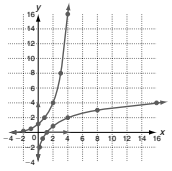
10. $\log_4 16$ — 2

11. $\log_a 1$ — 0

12. $\log_5 625$ — 4

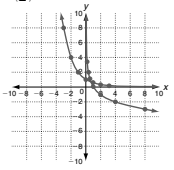
Use the given *x*-values to graph each function. Then graph its inverse. Describe the domain and range of the inverse function.

13. $f(x) = 2^x$; $x = -2, -1, 0, 1, 2, 3, 4$



Domain: $\{x | x > 0\}$; range: all real numbers

14. $f(x) = \left(\frac{1}{2}\right)^x$; $x = -3, -2, -1, 0, 1, 2, 3$



Domain: $\{x | x > 0\}$; range: all real numbers

Solve.

15. The hydrogen ion concentration in moles per liter for a certain brand of tomato-vegetable juice is 0.000316.

a. Write a logarithmic equation for the pH of the juice. — $\text{pH} = -\log(0.000316)$

b. What is the pH of the juice? — 3.5

LESSON 7-3

Practice C

Logarithmic Functions

Write each exponential equation in logarithmic form.

1. $20^3 = 8000$ — $\log_{20} 8000 = 3$

2. $11^4 = 14{,}641$ — $\log_{11} 14{,}641 = 4$

3. $a^b = c$ — $\log_a c = b$

Write each logarithmic equation in exponential form.

4. $\log_{10} 10{,}000{,}000 = 7$ — $10^7 = 10{,}000{,}000$

5. $\log_6 216 = 3$ — $6^3 = 216$

6. $\log_p q = r$ — $p^r = q$

Evaluate by using mental math.

7. log 1 — 0

8. log 10,000 — 4

9. log 1,000 — 3

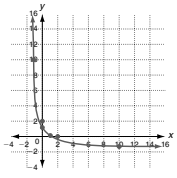
10. $\log_5 3125$ — 5

11. $\log_{15} 1$ — 0

12. $\log_4 256$ — 4

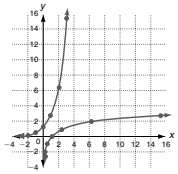
Use the given *x*-values to graph each function. Then graph its inverse. Describe the domain and range of the inverse function.

13. $f(x) = 0.1^x$; $x = -1, 0, 1, 2$



Domain: $\{x | x > 0\}$; range: all real numbers

14. $f(x) = \left(\frac{5}{2}\right)^x$; $x = -3, -2, -1, 0, 1, 2, 3$



Domain: $\{x | x > 0\}$; range: all real numbers

Solve.

15. The hydrogen ion concentration in moles per liter of a certain solvent is 0.00794.

a. Write a logarithmic equation for the pH of the solvent. — $\text{pH} = -\log(0.00794)$

b. What is the pH of the solvent? — 2.1

LESSON 7-3

Reteach

Logarithmic Functions

A **logarithm** is another way to work with exponents in equations.

If $b^x = a$, then $\log_b a = x$.

If *b* to the *x* power equals *a*, then *x* is the logarithm of *a* in base *b*.

Use the definition of the logarithm to write exponential equations in logarithmic form and to write logarithmic equations in exponential form.

Exponential Form		Logarithmic Form
$3^4 = 81$	base, $b = 3$; exponent, $x = 4$; value, $a = 81$	$\log_3 81 = 4$
Logarithmic Form		**Exponential Form**
$\log_5 125 = 3$	base, $b = 5$; exponent, $x = 3$; value, $a = 125$	$5^3 = 125$

If no base is written for a logarithm, the base is assumed to be 10.

Example: $\log 100 = 2$ because $10^2 = 100$.

Assume the base is 10.

Write each exponential equation in logarithmic form.

1. $7^2 = 49$

$b = 7$, $x = 2$, $a = 49$

$\log_7 49 = 2$

2. $6^3 = 216$

$b =$ 6, $x =$ 3, $a =$ 216

$\log_6 216 = 3$

3. $2^5 = 32$

$b = 2$, $x = 5$, $a = 32$

$\log_2 32 = 5$

Write each logarithmic equation in exponential form.

4. $\log_9 729 = 3$

$b = 9$, $x = 3$, $a = 729$

$9^3 = 729$

5. $\log_2 64 = 6$

$b =$ 2, $x =$ 6, $a =$ 64

$2^6 = 64$

6. log 1000 = 3

$b = 10$, $x = 3$, $a = 1000$

$10^3 = 1000$