

**LESSON**  
**7-3** **Practice B**  
**Logarithmic Functions**

Write each exponential equation in logarithmic form.

1.  $3^7 = 2187$

2.  $12^2 = 144$

3.  $5^3 = 125$

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Write each logarithmic equation in exponential form.

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

5.  $\log_4 1024 = 5$

6.  $\log_9 729 = 3$

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Evaluate by using mental math.

7.  $\log 1,000,000$

8.  $\log 10$

9.  $\log 1$

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10.  $\log_4 16$

11.  $\log_8 1$

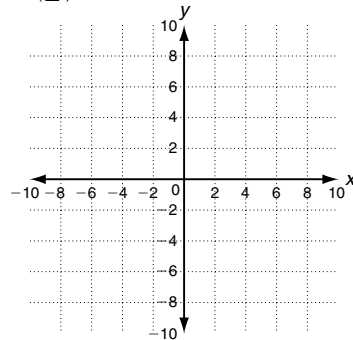
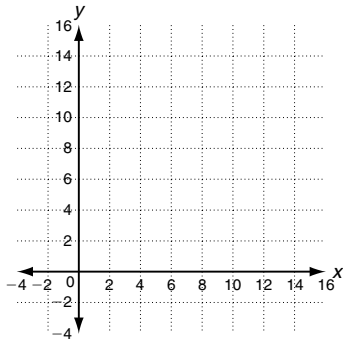
12.  $\log_5 625$

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

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

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



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**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.

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b. What is the pH of the juice?

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**LESSON** **Practice A**

**7-3 Logarithmic Functions**

Write each exponential equation in logarithmic form.

- |   |  |  |
|---|--|--|
| 1. $7^3 = 343$<br>$\log_{\text{base } 7} 343 = \text{exponent}$<br>$\log_7 343 = \underline{3}$ | 2. $2^6 = 64$<br>$\log_{\text{base } 2} 64 = \text{exponent}$<br>$\log_2 64 = \underline{6}$ | 3. $15^2 = 225$<br>$\log_{\text{base } 15} 225 = \text{exponent}$<br>$\log_{15} 225 = \underline{2}$ |
| 4. $2^3 = 8$<br>$\log_2 8 = \underline{3}$  | 5. $17^0 = 1$<br>$\log_{17} 1 = \underline{0}$   | 6. $1^{12} = 1$<br>$\log_1 1 = \underline{12}$   |
| 7. $4^5 = 1024$<br>$\log_4 1024 = \underline{5}$  | 8. $3^6 = 729$<br>$\log_3 729 = \underline{6}$   | 9. $5^4 = 625$<br>$\log_5 625 = \underline{4}$   |

Write each logarithmic equation in exponential form.

- |   |  |   |
|---|--|---|
| 10. $\log_4 64 = 3$<br>$\log_{\text{base } 4} 64 = \text{exponent}$<br>$4^3 = \underline{64}$ | 11. $\log_8 512 = 3$<br>$\log_{\text{base } 8} 512 = \text{exponent}$<br>$8^3 = \underline{512}$ | 12. $\log_6 36 = 2$<br>$\log_{\text{base } 6} 36 = \text{exponent}$<br>$6^2 = \underline{36}$ |
| 13. $\log_{10} 100 = 2$<br>$10^2 = \underline{100}$   | 14. $\log_5 125 = 3$<br>$5^3 = \underline{125}$  | 15. $\log_9 1 = 0$<br>$9^0 = \underline{1}$   |
| 16. $\log_2 128 = 7$<br>$2^7 = \underline{128}$   | 17. $\log_3 243 = 5$<br>$3^5 = \underline{243}$  | 18. $\log_{100} 1,000,000 = 3$<br>$100^3 = \underline{1,000,000}$                             |

Evaluate by using mental math.

- |   |  |   |
|---|--|---|
| 19. $\log 10,000$<br>$10^4 = 10,000$<br>$\log 10,000 = \underline{4}$                             | 20. $\log 100,000$<br>$10^5 = 100,000$<br>$\log 100,000 = \underline{5}$                   | 21. $\log 1$<br>$10^0 = 1$<br>$\log 1 = \underline{0}$          |
| 22. $\log_2 16$<br>$2^4 = 16$<br>$\log_2 16 = \underline{4}$                                      | 23. $\log_4 1$<br>$4^0 = 1$<br>$\log_4 1 = \underline{0}$                                  | 24. $\log_9 81$<br>$9^2 = 81$<br>$\log_9 81 = \underline{2}$    |
| 25. $\log_{100} 100,000,000$<br>$100^4 = 100,000,000$<br>$\log_{100} 100,000,000 = \underline{4}$ | 26. $\log 1,000,000,000$<br>$10^9 = 1,000,000,000$<br>$\log 1,000,000,000 = \underline{9}$ | 27. $\log_3 81$<br>$3^4 = 81$<br>$\log_3 81 = \underline{4}$    |
| 28. $\log_4 64$<br>$4^3 = 64$<br>$\log_4 64 = \underline{3}$                                      | 29. $\log_5 25$<br>$5^2 = 25$<br>$\log_5 25 = \underline{2}$                               | 30. $\log 1000$<br>$10^3 = 1000$<br>$\log 1000 = \underline{3}$ |

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**LESSON** **Practice C**

**7-3 Logarithmic Functions**

Write each exponential equation in logarithmic form.

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|--|--|--|
| 1. $20^3 = 8000$<br>$\log_{20} 8000 = \underline{3}$ | 2. $11^4 = 14,641$<br>$\log_{11} 14,641 = \underline{4}$ | 3. $a^b = c$<br>$\log_a c = \underline{b}$ |
|--|--|--|

Write each logarithmic equation in exponential form.

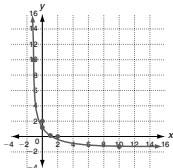
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| 4. $\log_{10} 10,000,000 = 7$<br>$10^7 = \underline{10,000,000}$ | 5. $\log_6 216 = 3$<br>$6^3 = \underline{216}$ | 6. $\log_p q = r$<br>$p^r = \underline{q}$ |
|--|--|--|

Evaluate by using mental math.

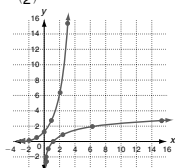
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| 7. $\log 1$<br>$10^0 = 1$<br>$\log 1 = \underline{0}$              | 8. $\log 10,000$<br>$10^4 = 10,000$<br>$\log 10,000 = \underline{4}$ | 9. $\log 1,000$<br>$10^3 = 1,000$<br>$\log 1,000 = \underline{3}$ |
| 10. $\log_5 3125$<br>$5^5 = 3125$<br>$\log_5 3125 = \underline{5}$ | 11. $\log_{15} 1$<br>$15^0 = 1$<br>$\log_{15} 1 = \underline{0}$     | 12. $\log_4 256$<br>$4^4 = 256$<br>$\log_4 256 = \underline{4}$   |

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

13.  $f(x) = 0.1^x$ ;  $x = -1, 0, 1, 2$
14.  $f(x) = (\frac{5}{2})^x$ ;  $x = -3, -2, -1, 0, 1, 2, 3$



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



Domain:  $\{x \mid x > 0\}$   
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?  $\underline{2.1}$

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**LESSON** **Practice B**

**7-3 Logarithmic Functions**

Write each exponential equation in logarithmic form.

- |  |  |  |
|--|--|--|
| 1. $3^7 = 2187$<br>$\log_3 2187 = \underline{7}$ | 2. $12^2 = 144$<br>$\log_{12} 144 = \underline{2}$ | 3. $5^3 = 125$<br>$\log_5 125 = \underline{3}$ |
|--|--|--|

Write each logarithmic equation in exponential form.

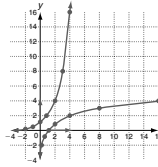
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|--|--|--|
| 4. $\log_{10} 100,000 = 5$<br>$10^5 = \underline{100,000}$ | 5. $\log_4 1024 = 5$<br>$4^5 = \underline{1024}$ | 6. $\log_9 729 = 3$<br>$9^3 = \underline{729}$ |
|--|--|--|

Evaluate by using mental math.

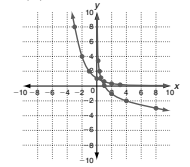
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|---|---|---|
| 7. $\log 1,000,000$<br>$10^6 = 1,000,000$<br>$\log 1,000,000 = \underline{6}$ | 8. $\log 10$<br>$10^1 = 10$<br>$\log 10 = \underline{1}$  | 9. $\log 1$<br>$10^0 = 1$<br>$\log 1 = \underline{0}$           |
| 10. $\log_4 16$<br>$4^2 = 16$<br>$\log_4 16 = \underline{2}$                  | 11. $\log_5 1$<br>$5^0 = 1$<br>$\log_5 1 = \underline{0}$ | 12. $\log_5 625$<br>$5^4 = 625$<br>$\log_5 625 = \underline{4}$ |

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

13.  $f(x) = 2^x$ ;  $x = -2, -1, 0, 1, 2, 3, 4$
14.  $f(x) = (\frac{1}{2})^x$ ;  $x = -3, -2, -1, 0, 1, 2, 3$



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



Domain:  $\{x \mid x > 0\}$   
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?  $\underline{3.5}$

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**LESSON** **Reteach**

**7-3 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.

<b>Exponential Form</b> $3^4 = 81$	<b>Logarithmic Form</b> $\log_3 81 = 4$
<b>Logarithmic Form</b> $\log_5 125 = 3$	<b>Exponential Form</b> $5^3 = 125$

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. $7^2 = 49$<br>$b = 7, x = 2, a = 49$<br>$\log_7 49 = \underline{2}$ | 2. $6^3 = 216$<br>$b = 6, x = 3, a = 216$<br>$\log_6 216 = \underline{3}$ | 3. $2^5 = 32$<br>$b = 2, x = 5, a = 32$<br>$\log_2 32 = \underline{5}$ |
|--|---|--|

Write each logarithmic equation in exponential form.

- |   |  |  |
|---|--|--|
| 4. $\log_9 729 = 3$<br>$b = 9, x = 3, a = 729$<br>$9^3 = \underline{729}$ | 5. $\log_2 64 = 6$<br>$b = 2, x = 6, a = 64$<br>$2^6 = \underline{64}$ | 6. $\log 1000 = 3$<br>$b = 10, x = 3, a = 1000$<br>$10^3 = \underline{1000}$ |
|---|--|--|

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