NAME _____ DATE _____ PERIOD _____

8-6 Study Guide and Intervention

Common Logarithms

Common Logarithms Base 10 logarithms are called **common logarithms**. The expression $\log_{10} x$ is usually written without the subscript as $\log x$. Use the LOG key on your calculator to evaluate common logarithms.

The relation between exponents and logarithms gives the following identity.

Inverse Property of Logarithms and Exponents	$10^{\log x} = x$

Example 1 **Evaluate log 50 to the nearest ten-thousandth.**

Use the LOG key on your calculator. To four decimal places, $\log 50 = 1.6990$.

Example 2 **Solve $3^{2x+1} = 12$.**

$3^{2x+1} = 12$	Original equation
$\log 3^{2x+1} = \log 12$	Property of Equality for Logarithmic Functions.
$(2x + 1) \log 3 = \log 12$	Power Property of Logarithms
$2x + 1 = \frac{\log 12}{\log 3}$	Divide each side by log 3.
$2x = \frac{\log 12}{\log 3} - 1$	Subtract 1 from each side.
$x = \frac{1}{2}\left(\frac{\log 12}{\log 3} - 1\right)$	Multiply each side by $\frac{1}{2}$.
$x = \frac{1}{2}\left(\frac{1.0792}{0.4771} - 1\right)$	Use a calculator.
$x \approx 0.6309$	

Exercises

Use a calculator to evaluate each expression to the nearest ten-thousandth.

1. log 18 **2.** log 39 **3.** log 120

4. log 5.8 **5.** log 42.3 **6.** log 0.003

Solve each equation or inequality. Round to the nearest ten-thousandth.

7. $4^{3x} = 12$ **8.** $6^{x+2} = 18$

9. $5^{4x-2} = 120$ **10.** $7^{3x-1} \geq 21$

11. $2.4^{x+4} = 30$ **12.** $6.5^{2x} \geq 200$

13. $3.6^{4x-1} = 85.4$ **14.** $2^{x+5} = 3^{x-2}$

15. $9^{3x} = 4^{5x+2}$ **16.** $6^{x-5} = 2^{7x+3}$

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8-6 Skills Practice

Common Logarithms

Use a calculator to evaluate each expression to the nearest ten-thousandth.

1. log 6

2. log 15

3. log 1.1

4. log 0.3

Solve each equation or inequality. Round to the nearest ten-thousandth.

5. $3^x > 243$

6. $16^v \leq \frac{1}{4}$

7. $8^p = 50$

8. $7^y = 15$

9. $5^{3b} = 106$

10. $4^{5k} = 37$

11. $12^{7p} = 120$

12. $9^{2m} = 27$

13. $3^{r-5} = 4.1$

14. $8^{y+4} > 15$

15. $7.6^{d+3} = 57.2$

16. $0.5^{t-8} = 16.3$

17. $42^{x^2} = 84$

18. $5^{x^2+1} = 10$

~~**Express each logarithm in terms of common logarithms. Then approximate its value to the nearest ten-thousandth.**~~

~~**19.** $\log_3 7$~~

~~**20.** $\log_5 66$~~

~~**21.** $\log_2 35$~~

~~**22.** $\log_6 10$~~

23. Use the formula pH $= -\log[H+]$ to find the pH of each substance given its concentration of hydrogen ions.

a. gastric juices: $[H+] = 1.0 \times 10^{-1}$ mole per liter

b. tomato juice: $[H+] = 7.94 \times 10^{-5}$ mole per liter

c. blood: $[H+] = 3.98 \times 10^{-8}$ mole per liter

d. toothpaste: $[H+] = 1.26 \times 10^{-10}$ mole per liter