NAME _____ DATE _____ PERIOD _____

Integrated Math 3

Chapter 6 Section 4 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 $\frac{1}{2}$.
$x \approx \frac{1}{2}\left(\frac{1.0792}{0.4771} - 1\right)$	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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Chapter 6 Section 4 Study Guide and Intervention *(continued)*

Common Logarithms

Change of Base Formula The following formula is used to change expressions with different logarithmic bases to common logarithm expressions.

Change of Base Formula	For all positive numbers a, b, and n, where $a \neq 1$ and $b \neq 1$, $\log_a n = \frac{\log_b n}{\log_b a}$.

Example: Express $\log_8 15$ in terms of common logarithms. Then round to the nearest ten-thousandth.

$\log_8 15 = \frac{\log_{10} 15}{\log_{10} 8}$ Change of Base Formula

≈ 1.3023 Simplify.

The value of $\log_8 15$ is approximately 1.3023.

Exercises

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

1. $\log_3 16$

2. $\log_2 40$

3. $\log_5 35$

4. $\log_4 22$

5. $\log_{12} 200$

6. $\log_2 50$

7. $\log_5 0.4$

8. $\log_3 2$

9. $\log_4 28.5$

10. $\log_3 (20)^2$

11. $\log_6 (5)^4$

12. $\log_8 (4)^5$

13. $\log_5 (8)^3$

14. $\log_2 (3.6)^6$

15. $\log_{12} (10.5)^4$

16. $\log_3 \sqrt{150}$

17. $\log_4 \sqrt[3]{39}$

18. $\log_5 \sqrt[4]{1600}$